HORIZON ENGINEERING LLC

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Project No. 5110

SOURCE EVALUATION REPORT

Clearwater Paper Corporation
Lewiston, Idaho

M&D Digesters No. 1 and No. 2
Internal Process Points

Methanol and TRS Compounds

Test Dates: April 8 through 12, 2014

Test Site:
Clearwater Paper Corporation
803 Mill Road
Lewiston, Idaho 83501

Report ID: HORIZON ENGINEERING 14-5110

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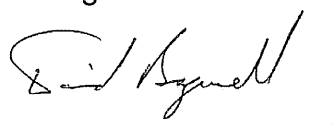
1. QUALITY STATEMENT

I certify that this testing was performed in accordance with Horizon Engineering's Quality Assurance Manual (QAM). At the date of this testing, Horizon Engineering was in conformance with ASTM D7036-04 "Standard Practice for Competence of Air Emission Testing Bodies." As of August 20, 2012 Horizon Engineering received interim accreditation status from the Stack Testing Accreditation Council (STAC). A copy of the interim accreditation letter from STAC is included in the Appendix of this report.

David Bagwell, QSTI
Technical Manager

Signature  Date 5/21/14

Name, Telephone Number and E-mail address of AETB
Horizon Engineering
503-255-5050
dbagwell@horizonengineering.com

Name and E-mail Address of the Qualification Exam Provider
Source Evaluation Society (SES)
qstiprogram@gmail.com

2. CERTIFICATION

2.1 Test Team Leader

I hereby certify that the test detailed in this report, to the best of my knowledge, was accomplished in conformance with applicable rules and good practices. The results submitted herein are accurate and true to the best of my knowledge.

Name: Joseph Heffernan III, QSTI

Signature _____ Date 5/23/14

2.2 Report Review

I hereby certify that I have reviewed this report and find it to be true and accurate, and in conformance with applicable rules and good practices, to the best of my knowledge.

Name: David Bagwell, QSTI

Signature _____ Date 5/21/14

2.3 Report Review

I hereby certify that I have reviewed this report and find it to be true and accurate, and in conformance with applicable rules and good practices, to the best of my knowledge.

Name: Michael E. Wallace, PE

Signature _____ Date 5/22/14

3. INTRODUCTION

3.1 Test Site: Clearwater Paper Corporation
803 Mill Road
Lewiston, Idaho 83501

3.2 Mailing Address: Same as Above

3.3 Test Log:

M&D No. 1

Sample Point 1A Exhaust to Kone Bin: Methanol and TRS

Modified EPA Method 308 Methanol, Flow Rate, Moisture

April 8, 2014	1	08:07 – 09:27 (Note 1)
"	2	09:58 – 10:58
"	3	11:40 – 13:09 (Note 1)

Modified EPA Method 16A TRS, Flow Rate, Moisture

April 8, 2014	1	14:05 – 15:03
"	2	15:19 – 16:18
"	3	16:38 – 17:38

Sample Point 2A Exhaust to Kone Bin: Methanol and TRS

Modified EPA Method 308 Methanol, Flow Rate, Moisture

April 9, 2014	1	08:45 – 09:45
"	2	10:08 – 11:08
"	3	12:26 – 13:26

Modified EPA Method 16A TRS, Flow Rate, Moisture

April 9, 2014	1	13:40 – 14:40
"	2	14:47 – 15:47
"	3	15:55 – 16:55

Summary: Three valid runs for Methanol and TRS each at Sample Points 1A and 2A for M&D No 1.

Note 1: Pauses during Runs 1 and 3 on Point 1A were due to sample equipment checks that are discussed in Section 6.1.3 Sampling Notes

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M&D No. 2

Sample Point 1B Exhaust to Kone Bin: Methanol and TRS

Modified EPA Method 308 Methanol, Flow Rate, Moisture

April 10, 2014	1	07:40 – 08:45
"	2	09:23 – 10:43
"	3	10:56 – 11:56

Modified EPA Method 16A TRS, Flow Rate, Moisture

April 10, 2014	1	12:46 – 13:46
"	2	13:53 – 14:53
"	3	15:00 – 16:00

Sample Point 2B Exhaust to Kone Bin: Methanol and TRS

Modified EPA Method 308 Methanol, Flow Rate, Moisture

April 11, 2014	1	07:45 – 08:45 (Note 2)
April 12, 2014	2	07:00 – 08:00
"	3	08:14 – 09:14

Modified EPA Method 16A TRS, Flow Rate, Moisture

April 12, 2014	1	09:24 – 10:24
"	2	10:31 – 11:31
"	3	11:35 – 12:35

Summary: Three valid runs for Methanol and TRS each at Sample Points 1B and 2B for M&D No 2.

Note 2: The testing was stopped after Run 1 on April 11 because of process malfunction and testing was not resumed until the following day.

3.4 Test Purpose: The test was to complete the required testing in EPA Request for Information (RFI) dated July 19, 2013 and extension granted on August 28, 2013. After observing the pre-test feasibility study and receiving the results, EPA revised the scope of sampling by eliminating Sample Points 3 and 4 on each of the digesters. In accordance with EPA's response letter, dated February 20, 2014, testing Sample Points 1 and 2 was required no later than 60 days from the date of the letter.

3.5 Background Information: As determined during the feasibility study in December 2013, the scope of testing covered by the RFI covers internal process gas streams that flow within process equipment that is not designed for sampling or testing. Inherent in these process gases are process liquids, process solids, fluctuating temperatures, and fluctuating moisture concentrations. During the pre-test feasibility study, Horizon Engineering concluded that, in light of process conditions, testing was infeasible for locations 1A, 2A, 1B, 2B, without significant modifications to test methods and atypical effort to reduce clogging and saturation prior to sampling. Even with these adjustments, testing results will be dependent upon process conditions and testers' ability to clear ports of steam saturation. All of the modifications to the methods and efforts during the testing to reduce clogging are contained in this report.

3.6 Participants:

Horizon Personnel:

Joseph Heffernan III, QSTI; Team Leader, Calculations, and Report Review

Kyle Kline, QSTI, Thomas Lyons, QSTI, and Jason Sweeney, Field Technicians

Michael E. Wallace, PE, Calculations and QA/QC

David Bagwell, QSTI, Report Review

Kate Krisor, Technical Writer

Test Arranged by: Rick Wilkinson, Marv Lewallen, and Bob Pernsteiner, Clearwater Paper Corporation

Observers:

Plant Personnel: Rick Wilkinson and Bob Pernsteiner
Agency Personnel: Zach Hedgpeth, Environmental Engineer, EPA Region 10
Test Plan Sent to: Roylene Cunningham and. Zach Hedgpeth, P.E., EPA – Region 10

4. SUMMARY OF RESULTS

A summary of methanol emissions and TRS concentrations in the units specified by the EPA Request for Information letter dated July 19, 2013 are in Table 1. Individual run results for each sample point are in two tables, one for methanol and one for TRS. Sample point 1A results are in Tables 2 and 3, sample point 2A results in Tables 4 and 5; sample point 1B results in Tables 6 and 7; sample point 2B results in Tables 8 and 9.

4.1 Tables of Results: (See Following Pages)

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Table 1

Methanol & TRS Compounds – Summary of Three-Run Averaged Results
M&D No. 1 Points 1A & 2A; M&D No. 2 Points 1B & 2B
Test Dates: April 8 through 12, 2014

		M&D No. 1		M&D No. 2	
	Units	**Point 1A**	**Point 2A**	**Point 1B**	**Point 2B**
Methanol					
Methanol Conc. Dry Basis	ppmv (dry) [1]	14,360	14,438	29,545	42,594
Conc. Actual Basis	ppmv (wet) [2]	310	336	421	467
Rate	lb/hr	1.33	1.52	1.66	1.73
Sum 1A + 2A [3]	lb/hr	--	2.85	--	--
Production-Based M&D 1	lb/ton ODT	--	0.281	--	--
Sum 1B + 2B	lb/hr	--	--	--	3.39
Production-Based M&D 2	lb/ton ODT	--	--	--	0.380
TRS Compounds					
Hydrogen Sulfide					
Dry Basis	ppmv (dry)	70.5	<73.3 [4]	<4.8	<51.2
Actual Basis	ppmv (wet)	0.9	<0.8	<0.032	<0.22
Methyl Mercaptan					
Dry Basis	ppmv (dry)	6,540	11,354	7,360	13,040
Actual Basis	ppmv (wet)	87.6	113.6	53.1	56.8
Dimethyl Sulfide					
Dry Basis	ppmv (dry)	31,402	61,421	1,034	1,463
Actual Basis	ppmv (wet)	424.2	611	6.9	6.7
Dimethyl Disulfide					
Dry Basis	ppmv (dry)	434.1	591.9	726.2	653.1
Actual Basis	ppmv (wet)	5.8	5.5	5.1	3.1

[1] Concentration in ppmv dry basis is calculated using the laboratory total sample weight corrected with the aliquot dilution factor.
[2] Concentration in ppmv wet basis is calculated using the ppmv dry basis multiplied by the moisture measured in the gas stream.
[3] Production-based results are calculated using the sum of the emission rates for the two sample points at each digester divided by the production rate.
[4] If the concentration of at least one run is below the laboratory Method Reporting Limit (MRL) the average results are reported as less than and the value of the MRL was used in calculation for each run below the MRL.

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Table 2

M&D No. 1, Point 1A – Methanol Test Results

Test Date: April 8, 2014	**Units**	**Run 1**	**Run 2**	**Run 3**	**Average**
Start Time		08:07	09:58	11:40	
End Time		09:27	10:58	13:09	
Sampling Time	minutes	60	60	63	61
Sampling Results					
Methanol Conc. Dry Basis	ppmv (dry) [5]	13,024	15,010	15,048	14,360
Conc. Actual Basis	ppmv (wet) [6]	304	306	319	310
Concentration	gr/dscf	7.6	8.7	8.8	8.4
Rate	lb/hr	1.3	1.4	1.3	1.3
Sample Point 2A	lb/hr	1.8	1.5	1.3	1.5
Sample Points 1A & 2A	lb/hr	3.1	2.9	2.5	2.8
Production Based (M&D 1)	lb/ton ODT	0.31	0.30	0.24	0.28
M308 Vol. Dilution Corrected	dsL	28.5	27.9	25.2	27.2
	dscf	1.0	0.99	0.89	0.96
Sample Vol. Dilution Air Factor		2.0	2.0	2.2	2.1
Total Sample Wt, Aliquot Corr. [7]	mg	498.7	562.4	508.9	523.3
Flow Rate (Actual)	acf/min	1,100	1,200	1,010	1,100
Flow Rate (Standard)	dscf/min	19.8	18.9	16.6	18.4
Temperature	°F	210	211	211	211
Calculated Moisture [8]	%	97.7	98.0	97.9	97.9
Process/Production Data					
Digester Production Rate	ODT/day	242.7	244.8	244.4	244.0
	ODT/hr	10.1	10.2	10.2	10.2
Sawdust Mass Feed Rate	rpm	13.0	13.0	13.0	13.0
Cooking Liquor Volume	gpm	260.7	260.7	260.7	260.7
Bauer Valve Rate	rpm	20.9	21.0	21.1	21.0
Exhaust Chamber Temp.	°F				175
Exhaust Condenser Temp.	°F	63.3	68.0	84.5	71.9

[5] Concentration in ppmv dry basis is calculated using the laboratory total sample weight corrected for the aliquot volume sent to laboratory and the sample volume corrected for dilution air.
[6] Concentration in ppmv wet basis is calculated using the ppmv dry basis multiplied by the moisture measured in the gas stream.
[7] The sample volume was corrected because an aliquot of the total volume was sent to the laboratory.
[8] Calculated moisture from the EPA Method 308 sample recovery data was used instead of ODEQ Method 4 wet bulb/dry bulb because the exhaust gas was essentially steam.

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Table 3

M&D No. 1, Point 1A – TRS Compounds Test Results

Test Date: April 8, 2014	**Units**	**Run 1**	**Run 2**	**Run 3**	**Average**
Start Time		14:05	15:19	16:38	
End Time		15:03	16:18	17:38	
Sampling Results					
Hydrogen Sulfide, Dry Basis	ppmv (dry)	70.6	50.3	90.8	70.5
Actual Basis	ppmv (wet)	1.1	0.8	1.0	0.9
Sample Wt Dilution Corrected	mg	0.067	0.043	0.087	0.066
Methyl Mercaptan, Dry Basis	ppmv (dry)	6,921	5,512	7,186	6,540
Actual Basis	ppmv (wet)	103.8	83.8	75.2	87.6
Sample Wt Dilution Corrected	mg	9.3	6.6	9.7	8.5
Dimethyl Sulfide, Dry Basis	ppmv (dry)	35,726	26,264	32,216	31,402
Actual Basis	ppmv (wet)	535.7	399.5	337.2	424.2
Sample Wt Dilution Corrected	mg	62.0	40.5	56.3	52.9
Dimethyl Disulfide, Dry Basis	ppmv (dry)	432.0	368.1	502.2	434.1
Actual Basis	ppmv (wet)	6.5	5.6	5.3	5.8
Sample Wt Dilution Corrected	mg	1.1	0.86	1.3	1.1
M16A.Volume. Dilution Corrected	dsm	0.00067	0.00060	0.00068	0.00065
Sample Vol. Dilution Air Factor		7.7	8.5	7.6	7.9
Flow Rate (Actual)	acf/min	1,000	970	904	959
Flow Rate (Standard)	dscf/min	11.7	11.5	7.4	10.2
Temperature	°F	212	212	212	212
Calculated Moisture [9]	%	98.5	98.5	99.0	98.6
Process/Production Data					
Digester Production Rate	ODT/day	244.4	246.1	245.8	245.4
	ODT/hr	10.2	10.3	10.2	10.2
Sawdust Mass Feed Rate	rpm	13.0	13.0	13.0	13.0
Cooking Liquor Volume	gpm	258.2	256.7	256.6	257.2
Bauer Valve Rate	rpm	21.0	20.9	20.8	20.9
Exhaust Chamber Temp.	°F				180
Exhaust Condenser Temp.	°F	102.6	103.2	99.4	101.7

[9] Calculated moisture from the EPA Method 16A sample recovery data was used instead of ODEQ Method 4 wet bulb/dry bulb because the exhaust gas was essentially steam.

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Table 4

M&D No. 1, Point 2A – Methanol Test Results

Test Date: April 9, 2014	**Units**	**Run 1**	**Run 2**	**Run 3**	**Average**
Start Time		08:45	10:08	12:26	
End Time		09:45	11:08	13:26	
Sampling Time	minutes	60	60	60	60
Sampling Results					
Methanol Conc. Dry Basis	ppmv (dry)	14,163	16,558	12,593	14,438
Conc. Actual Basis	ppmv (wet)	358	344	307	336
Concentration	gr/dscf	8.2	9.6	7.3	8.4
Rate	lb/hr	1.8	1.5	1.3	1.5
Sample Point 1A	lb/hr	1.3	1.4	1.3	1.3
Sample Points 1A & 2A	lb/hr	3.1	2.9	2.5	2.8
Production Based (M&D 1)	lb/ton ODT	0.31	0.30	0.24	0.28
M308 Vol. Dilution Corrected	dsL	28.8	28.4	28.7	28.6
	dscf	1.02	1.00	1.01	1.01
Sample Vol. Dilution Air Factor		2.0	2.0	2.0	2.0
Total Sample Wt, Aliquot Corr. 7	mg	542	627	481	550
Flow Rate (Actual)	acf/min	1,290	1,070	1,050	1,140
Flow Rate (Standard)	dscf/min	26.0	17.6	20.3	21.3
Temperature	°F	212	212	212	212
Calculated Moisture	%	97.5	97.9	97.6	97.7
Process/Production Data					
Digester Production Rate	ODT/day	249.1	224.2	254.7	242.7
	ODT/hr	10.4	9.3	10.6	10.1
Sawdust Mass Feed Rate	rpm	13.4	12.1	13.0	12.8
Cooking Liquor Volume	gpm	266.7	279.8	277.1	274.5
Bauer Valve Rate	rpm	20.8	21.0	21.2	21.0
Exhaust Chamber Temp.	°F				170
Exhaust Condenser Temp.	°F	64.0	64.8	75.2	68.0

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Table 5

M&D No. 1, Point 2A – TRS Compounds Test Results

Test Date: April 9, 2014	**Units**	**Run 1**	**Run 2**	**Run 3**	**Average**
Start Time		13:40	14:47	15:55	
End Time		14:40	15:47	16:55	
Sampling Results					
Hydrogen Sulfide, Dry Basis	ppmv (dry)	97.8	<7.3 [10]	114.7	<73.3
Actual Basis	ppmv (wet)	1.1	<0.041	1.3	<0.8
Sample Wt Dilution Corrected	mg	0.1083	<0.0102	0.0941	<0.0709
Methyl Mercaptan, Dry Basis	ppmv (dry)	11,781	8,291	13,989	11,353
Actual Basis	ppmv (wet)	131.6	46.9	162.5	113.6
Sample Wt Dilution Corrected	mg	18.40	16.67	16.21	17.00
Dimethyl Sulfide, Dry Basis	ppmv (dry)	64,393	46,491	73,379	61,421
Actual Basis	ppmv (wet)	719.1	262.8	852.2	611.4
Sample Wt Dilution Corrected	mg	129.9	118.6	109.8	119.4
Dimethyl Disulfide, Dry Basis	ppmv (dry)	548.6	627.9	599.2	591.9
Actual Basis	ppmv (wet)	6.1	3.5	7.0	5.5
Sample Wt Dilution Corrected	mg	1.68	2.42	1.36	1.82
M16A.Volume Dilution Corrected	dsm	0.00078	0.00099	0.00058	0.00078
Sample Vol. Dilution Air Factor		6.9	5.7	9.0	7.2
Flow Rate (Actual)	acf/min	1,090	1,220	1,110	1,140
Flow Rate (Standard)	dscf/min	9.7	5.5	10.3	8.5
Temperature	°F	212	212	212	212
Calculated Moisture	%	98.9	99.4	98.8	99.1
Process/Production Data					
Digester Production Rate	ODT/day	254.0	249.5	246.7	250.1
	ODT/hr	10.6	10.4	10.3	10.4
Sawdust Mass Feed Rate	rpm	13.5	13.5	13.5	13.5
Cooking Liquor Volume	gpm	283.1	282.4	281.1	282.2
Bauer Valve Rate	rpm	21.1	21.0	20.9	21.0
Exhaust Chamber Temp.	°F				175
Exhaust Condenser Temp.	°F	80.0	82.4	80.7	81.0

[10] Hydrogen sulfide concentration for Run 2 was below the laboratory Method Reporting Limit (MRL) and the value of the MRL was used in calculations.

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Table 6

M&D No. 2, Point 1B – Methanol Test Results

Test Date: April 10, 2014	**Units**	**Run 1**	**Run 2**	**Run 3**	**Average**
Start Time		07:40	09:23	10:56	
End Time		08:46	10:43	11:56	
Sampling Time	minutes	60	60	60	60
Sampling Results					
Methanol Conc. Dry Basis	ppmv (dry)	32,581	23,364	32,690	29,545
Conc. Actual Basis	ppmv (wet)	421	379	462	421
Concentration	gr/dscf	19.0	13.6	19.0	17.2
Rate	lb/hr	1.8	1.6	1.6	1.7
Sample Point 2B	lb/hr	1.5	2.0	1.7	1.7
Sample Points 1B & 2B	lb/hr	3.3	3.6	3.3	3.4
Production Based (M&D 2)	lb/ton ODT	0.37	0.40	0.37	0.38
M308 Vol. Dilution Corrected	dsL	28.4	28.4	27.8	28.2
	dscf	1.0	1.0	0.98	0.99
Sample Vol. Dilution Air Factor		2.0	2.0	2.0	2.0
Total Sample Wt, Aliquot Corr. 7	mg	1,233	883	1,209	1,108
Flow Rate (Actual)	acf/min	1,110	1,090	885	1,030
Flow Rate (Standard)	dscf/min	11.1	13.8	9.7	11.5
Temperature	°F	212	212	213	212
Calculated Moisture	%	98.7	98.4	98.6	98.6
Process/Production Data					
Digester Production Rate	ODT/day	215.6	216.2	215.5	215.8
	ODT/hr	9.0	9.0	9.0	9.0
Sawdust Mass Feed Rate	rpm	11	11	12	11
Cooking Liquor Volume	gpm	271	268	266	268
Bauer Valve Rate	rpm	50	48	48	49
Exhaust Chamber Temp.	°F				165
Exhaust Condenser Temp.	°F	47	54	64	55

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Table 7

M&D No. 2, Point 1B – TRS Compounds Test Results

Test Date: April 10, 2014	**Units**	**Run 1**	**Run 2**	**Run 3**	**Average**
Start Time		12:46	13:53	15:00	
End Time		13:46	14:53	16:00	
Sampling Results					
Hydrogen Sulfide, Dry Basis	ppmv (dry)	2.2	10.7	<1.4	<4.8
Actual Basis	ppmv (wet)	0.017	0.069	<0.010	<0.032
Sample Wt Dilution Corrected	mg	0.0021	0.010	<0.0015	<0.0046
Methyl Mercaptan, Dry Basis	ppmv (dry)	4,627	10,260	8,004	7,630
Actual Basis	ppmv (wet)	36.4	65.7	57.2	53.1
Sample Wt Dilution Corrected	mg	6.2	13.9	12.0	10.7
Dimethyl Sulfide, Dry Basis	ppmv (dry)	328.4	2,207	565.9	1,034
Actual Basis	ppmv (wet)	2.6	14.1	4.0	6.9
Sample Wt Dilution Corrected	mg	0.57	3.87	1.09	1.17
Dimethyl Disulfide, Dry Basis	ppmv (dry)	393.9	931.5	853.2	726.2
Actual Basis	ppmv (wet)	3.1	6.0	6.1	5.1
Sample Wt Dilution Corrected	mg	1.04	2.48	2.50	2.00
M16A.Volume Dilution Corrected	dsm	0.00067	0.00068	0.00075	0.00070
Sample Vol. Dilution Air Factor		7.7	7.6	7.0	7.4
Flow Rate (Actual)	acf/min	1,300	1,070	1,080	1,150
Flow Rate (Standard)	dscf/min	7.9	5.3	6.0	6.4
Temperature	°F	213	213	213	213
Calculated Moisture	%	99.2	99.4	99.3	99.2
Process/Production Data					
Digester Production Rate	ODT/day	215.0	214.6	213.9	214.5
	ODT/hr	9.0	8.9	8.9	8.9
Sawdust Mass Feed Rate	rpm	12	11	12	12
Cooking Liquor Volume	gpm	261	259	259	260
Bauer Valve Rate	rpm	22	22	22	22
Exhaust Chamber Temp.	°F				170
Exhaust Condenser Temp.	°F	79	82	81	81

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Table 8

M&D No. 2, Point 2B – Methanol Test Results

Test Dates: April 11-12, 2014	**Units**	**Run 1**	**Run 2**	**Run 3**	**Average**
Test Date		April 11	April 12	April 12	
Start Time		07:45	07:00	08:14	
End Time		08:45	08:00	09:14	
Sampling Time	minutes	60	60	60	60
Sampling Results					
Methanol Conc. Dry Basis	ppmv (dry)	30,000	47,612	50,169	42,594
Conc. Actual Basis	ppmv (wet)	398	490	513	467
Concentration	gr/dscf	17.5	27.7	29.2	24.8
Rate	lb/hr	1.5	2.0	1.7	1.7
Sample Point 1B	lb/hr	1.8	1.6	1.6	1.7
Sample Points 1B & 2B	lb/hr	3.3	3.6	3.3	3.4
Production Based (M&D 2)	lb/ton ODT	0.37	0.40	0.37	0.38
M308 Vol. Dilution Corrected	dsL	27.9	27.4	27.7	27.7
	dscf	0.98	0.97	0.98	0.98
Sample Vol. Dilution Air Factor		2.1	2.0	2.0	2.0
Total Sample Wt, Aliquot Corr. 7	mg	1,115	1,740	1,852	1,569
Flow Rate (Actual)	acf/min	982	1,036	861	960
Flow Rate (Standard)	dscf/min	10.1	8.3	6.8	8.4
Temperature	°F	212	212	212	212
Calculated Moisture	%	98.7	99.0	99.0	98.9
Process/Production Data					
Digester Production Rate	ODT/day	215.2	211.8	212.6	213.2
	ODT/hr	9.0	8.8	8.9	8.9
Sawdust Mass Feed Rate	rpm	11	12	11	11
Cooking Liquor Volume	gpm	265	292	271	276
Bauer Valve Rate	rpm	22	22	22	22
Exhaust Chamber Temp.	°F				160
Exhaust Condenser Temp.	°F	47	47	51	48

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Table 9

M&D No. 2, Point 2B – TRS Compounds Test Results

Test Dates: April 11-12, 2014	**Units**	**Run 1**	**Run 2**	**Run 3**	**Average**
Test Date		April 11	April 12	April 12	
Start Time		09:24	10:31	11:35	
End Time		10:24	11:31	12:35	
Sampling Results					
Hydrogen Sulfide, Dry Basis	ppmv (dry)	72.8	<2.1 [11]	78.9	<51.2
Actual Basis	ppmv (wet)	0.39	<0.012	0.25	<0.22
Sample Wt Dilution Corrected	mg	0.056	<0.0015	0.064	<0.040
Methyl Mercaptan, Dry Basis	ppmv (dry)	11,723	8,311	19,085	13,040
Actual Basis	ppmv (wet)	63.3	47.5	59.7	56.8
Sample Wt Dilution Corrected	mg	12.8	8.7	21.7	14.4
Dimethyl Sulfide, Dry Basis	ppmv (dry)	1,598	1,060	1,730	1,463
Actual Basis	ppmv (wet)	8.6	6.1	5.4	6.7
Sample Wt Dilution Corrected	mg	2.3	1.4	2.5	2.1
Dimethyl Disulfide, Dry Basis	ppmv (dry)	671	599	689	653
Actual Basis	ppmv (wet)	3.6	3.4	2.2	3.1
Sample Wt Dilution Corrected	mg	1.4	1.2	1.5	1.4
M16A.Volume Dilution Corrected	dsm	0.00055	0.00052	0.000557	0.00055
Sample Vol. Dilution Air Factor		9.4	9.8	9.3	9.5
Flow Rate (Actual)	acf/min	916	930	957	935
Flow Rate (Standard)	dscf/min	3.8	4.1	2.3	3.4
Temperature	°F	212	212	212	212
Calculated Moisture	%	99.5	99.4	99.7	99.5
Process/Production Data					
Digester Production Rate	ODT/day	213.9	215.9	214.8	214.9
	ODT/hr	8.9	9.0	9.0	9.0
Sawdust Mass Feed Rate	rpm	11	11	11	11
Cooking Liquor Volume	gpm	270	258	250	259
Bauer Valve Rate	rpm	22	22	22	22
Exhaust Chamber Temp.	°F				170
Exhaust Condenser Temp.	°F	55	60	69	61

[11] Hydrogen sulfide concentration for Run 2 was below the laboratory MRL and the value of the MRL was used in calculations.

4.2 Discussion of Method Errors and Quality Assurance Procedures:
This table is taken from a paper entitled "Significance of Errors in Stack Sampling Measurements," by R.T. Shigehara, W.F. Todd and W.S. Smith. It summarizes the maximum error expressed in percent, which may be introduced into the test procedures by equipment or instrument limitations.

Measurement	% Max Error
Stack Temperature Ts	1.4
Meter Temperature Tm	1.0
Stack Gauge Pressure Ps	0.42
Meter Gauge Pressure Pm	0.42
Atmospheric Pressure Patm	0.21
Dry Molecular Weight Md	0.42
Moisture Content Bws (Absolute)	1.1
Differential Pressure Head ΔP	10.0
Orifice Pressure Differential ΔH	5.0
Pitot Tube Coefficient Cp	2.4
Orifice Meter Coefficient Km	1.5
Diameter of Probe Nozzle Dn	0.80

4.2.1 Manual Methods: QA procedures outlined in the test methods were followed, including equipment specifications and operation, calibrations, sample recovery and handling, calculations and performance tolerances.

On-site quality control procedures include pre- and post-test leak checks on the sampling system and pitot lines. If pre-test checks indicate problems, the system is fixed and rechecked before starting testing. If post-test leak checks are not acceptable, the test run is voided and the run is repeated. The results of the leak checks for the test runs are on the Field Data sheets.

Thermocouples used to measure the exhaust temperature are calibrated in the field using EPA Alternate Method 11. A single-point calibration on each thermocouple system using a reference thermometer is performed.

Thermocouples must agree within ±2°F with the reference thermometer. Also, prior to use, thermocouple systems are checked for ambient temperature before heaters are started or readings are taken. Pitots are examined before and after each use to confirm that they are still aligned. The results were within allowable tolerances. Pre- and post-test calibrations on the liter meters are included with the report along with semi-annual calibrations of pitots, thermocouples, and thermocouple indicators.

4.2.2 Audit Requirement: The EPA Stationary Source Audit Sample Program was restructured and promulgated on September 30, 2010 and was made effective 30 days after that date. The Standard requires that the Facility or their representative order audit samples from an accredited Provider. The EPA restructured program requires that two accredited providers be available, and that available audit samples must be listed on the EMC website 60 days before audits are required. The TNI website www.nelac-institute.org/ssas/ was referred to for a list of available accredited audit providers and audits.

There were no audit samples available for any of the test methods covered in this test program. If samples are not available, then audit sample analyses are not required. Based on the above, CLW is not required to obtain audit samples for this test program.

4.2.3 EPA Method 308 and 16A QA/QC: The QA/QC procedures for methanol and TRS sampling are described fully in the Source Test Plan. The measures addressed include types of sample containers used, as well as handling and shipping the sample containers to the laboratory safely, securely and within analysis dictated hold times.

Laboratory QA results are in the ALS laboratory reports. Field blanks, method blanks, duplicate analysis, matrix spike and laboratory control samples were within acceptable limits.

5. SOURCE DESCRIPTION AND OPERATION

5.1 Process and Control Device Description and Operation:

Process Description:

The sawdust pulping system includes two M&D continuous digesters, each operating at approximately 250 ADT/day of equivalent bleached pulp production. Two sawdust storage silos pneumatically feed sawdust to the top of a cyclone separator, where the wood and transport air are separated. On each line, the wood drops into a storage vessel known as the Kone bin, located below the cyclone. Each Kone bin typically contains 10 to 15 feet of wood during normal operation.

On each line, sawdust gravity feeds from the Kone bin into a metering screw, which feeds a rotary inlet valve known as the Bauer valve, before dropping into the digester itself. The rotary inlet valve contains 10 pockets. As the pockets rotate they are sealed against the casing of the valve. The seal prevents back-flow from the pressurized digester vessel.

Fresh steam is used in each rotary inlet valve to heat the sawdust, to pressurize the valve pockets, and to help push sawdust out of the valve pockets to purge the pocket. Sawdust then falls by gravity into the digester vessel. The majority of this steam is either discharged into the digester vessel with the sawdust, or is recycled from the discharge side of the valve to the inlet side of the valve via the primary exhaust line. Secondary exhaust from each rotary inlet valve flows to an exhaust chamber, where it is sprayed with a condensing shower of mill water. Any remaining material not condensed and injected into the sawdust through the metering screw will move through two lines into the bottom of the Kone bin. In addition to the secondary exhaust line, a line from the drop chute between the metering screw and the rotary inlet valve also flows to the exhaust chamber. (See Figure 1).

Once the wood enters the digester it falls onto a midfeather separating plate, where it is confined between constantly moving flights. The flights carry the sawdust down the top side of the midfeather, around the lower end of the digester, and then up the bottom half of the divided digester. When the sawdust reaches the top of the digester, it exits out of the discharge nozzle (on the bottom side of the digester) and falls into the surge tube, before going on to the blow tank. From the blow tank the sawdust pulp is washed and screened, prior to a final bleaching operation.

5.2 Test Ports: Port locations for the four process sample points identified by EPA are listed below and described on the diagrams provided by Horizon Engineering Field Data Sheets.

- Sample Point 1a M&D No. 1: Exhaust to Kone Bin
- Sample Point 2a M&D No. 1: Exhaust to Kone Bin
- Sample Point 1b M&D No. 2: Exhaust to Kone Bin
- Sample Point 2b M&D No. 2: Exhaust to Kone Bin

Figure 1 - Process and Sample Point Diagram

Note: The above diagram reflects M&D No.1 installed sample points 1a, 2a, 3a, & 4a. Installed sample points 1b, 2b, 3b, & 4b for M&D No.2 are located in the same relative position.

Special ports with piping and valves to close off the duct when the ports were opened were installed on the process points by Clearwater personnel for testing because of the significant safety concerns identified in the feasibility study mentioned in Section 3.5 Background Information. One smaller diameter pipe port (1/4”) was installed and the testers used a pipe adapter fitted to the outside for temperature, moisture and methanol sampling.

Two ports were located at 90° angles on the horizontal ducts for points 1a, 1b, 2a, and 2b for flow measurement. The two port pipes met EPA Method 1A criteria. One port was at the side of the duct and one at the bottom of the duct. The side ports were used for flow testing; the bottom ports could not be used because of material exiting the port. The testers used a wider diameter pipe adapter fitted to the outside of the flow port to allow use of the S-type pitot. A single adapter was moved to each sample point for flow measurements.

5.2.1 Test Duct Characteristics:
M&D 1 and 2: Sample Points 1A, 2A, 1B, 2B
Construction: Steel
Shape: Circular
Size: 8.5 inches inside diameter
Orientation: Horizontal
Flow straighteners: None
Extension: None
Cyclonic Flow: No Cyclonic flow expected
Meets EPA Method 1A Criteria: Yes
Note: Side Ports only, as described above

5.3 Operating Parameters: See Production/Process Data section of Appendix. Process data was gathered by the Site Personnel and provided to Horizon for inclusion in the report for the period of time beginning at least 30 days prior to the testing and extending at least 5 days after the testing concluded. Clearwater Paper included all of the hourly data that EPA requested, as well as parameters that CLW does not normally collect on an hourly basis. The hourly parameters as well as the exceptions were listed in the Source Test Plan in Sections 16 and 19. Selected items from the list are summarized on a run basis in the summary tables in Section 3 above.

The operating mode during the feasibility study was at normal operating rates and conditions. The pulp from these digesters was processed through a 4-stage brownstock washing line, and then through a 4-stage bleach plant. The pulp is used in the manufacture of bleached paperboard.

5.4 Process Startups/Shutdowns or Other Operational Changes During Tests: Process was continuous during each run, except during Run 2 on April 9, 2014 for Sample Point 2A. During that run the Washer went down for about 10 minutes, causing the production speed to drop from 13 rpm to 4 rpm. The testing was not paused.

On April 11, 2014, after Run 1 on Sampling Point 2B, the process was shut down by Clearwater personnel and not resumed for the remainder of the day. Testing was stopped and then resumed on April 12, 2014.

5.5 On-Site Photographs: (See Following Pages)

Figure 2
Flow Sampling on Sample Point 1A

Figure 3
Sampling on Sample Point 1A

Figure 4
Flow Sampling on Sample Point 2A

Figure 5
Sampling on Sample Point 2A

Figure 6
Flow Sampling on Sample Point 1B

Figure 7
Sampling on Sample Point 1B

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Figure 8
Flow Sampling on Sample Point 2B

Figure 9
Sampling on Sample Point 2B

6. SAMPLING AND ANALYTICAL PROCEDURES

6.1 Sampling Procedures:

6.1.1 Sampling and Analytical Methods: Testing was in accordance with procedures and methods listed in the Source Test Plan dated March 31, 2014 (see Correspondence Section in the Appendix), including the following: EPA methods in Title 40 Code of Federal Regulations Part 60 (40 CFR 60), Appendix A, July 1, 2011 and the Emission Measurement Technical Information Center's website, Test Methods Section (www.epa.gov/ttn/emc)

Sample Points 1A and 2A (M&D No.1) and 1B and 2B (M&D No.2):

Flow Rate:	Modified EPA Methods 1A and 2C (S-type pitot flow traverses of duct <12")
CO_2 and O_2:	Assume ambient molecular weight 28.96
Moisture:	EPA Method 4 (incorporated w/non-isokinetic sampling methods 308 and 16A)—did not used ODEQ Method 4 (wb/db) as in source test plan; see Section 6.1.3. Sampling Notes.
Methanol:	Modified EPA Method 308 (non-isokinetic, sorbent tube and impinger train technique with analysis by GC/FID)
TRS:	Modified EPA Method 16A (silonite coated Summa canister with analysis by GC/SCD per ASTM D 5504-08)

6.1.2 Allowed Variances to Methods: The following modifications to the test methods were approved by EPA prior to testing, with documentation in the Correspondence section of the report.

Modified EPA Methods 1A and 2C: Two flow measurement ports are located at 90° angles on the horizontal ducts for process points 1A, 2A, 1B and 2B. The port location meets EPA Method 1A criteria, but only the side ports can be used for flow testing. The bottom ports cannot be used because when opened for access, process liquid and sawdust pour out. Therefore flow measurements were taken from one traverse across the duct, through the side ports. The testers cleared the pitot lines continually throughout the test, blowing into the lines to purge them.

Modified EPA Method 308: The EPA Method 308 sampling train was modified in the following ways:

- Teflon tubing was fitted on to the pipe port.
- Dilution air (N_2) was introduced via heated sample line into the Teflon tubing, downstream from the connection to the pipe port.
- Three chilled, empty impingers were added for moisture removal.

The amount of dilution air added was measured by a mass flow controller capable of measuring 0-2 standard lpm, at 70°F. Based on the EPA Method 308 results obtained from the pre-test feasibility study, up to 95% dilution air could have been added without driving the MeOH below the analytical detection limit. The testers targeted a 50% dilution ratio and this was achieved by setting the mass flow controller to half the sampling rate. The modified EPA Method 308 was sampled between 200-1000 ml/min to target a minimum sample volume of 60 liters (wet). The dilution results are included in the Summary Tables for methanol results and show that the testers met the target.

Modified EPA Method 16A EPA Method 16A is intended for the TRS sampling of various Kraft plant sources. The principal of analysis is to scrub the sample of SO_2 using citrate buffer, oxidize the remaining TRS compounds, then measuring as SO_2. The testing methodology of EPA Method 16A was adapted for a different analysis technique for this test. Dry gas samples were obtained using a sampling setup that included chilled impingers for moisture knockout and collection of sample in silonite-coated Summa canister and were analyzed according to ASTM D 5504-08, by GC/SCD, for the speciated TRS compounds of interest.

This configuration is applicable because SO_2 is not a concern and the TRS compounds are not soluble enough to be scrubbed out as condensate collects, therefore using citrate buffer and preventing moisture is not necessary. A clean and dry TRS sample may be obtained by placing impingers with a sufficient knockout volume prior to the Summa can.

This testing was also obtained using a target 50% dilution ratio. The analytical detection limits for the speciated TRS compounds of interest are less than 10 ppb. The modified EPA Method 16A was sampled at a constant rate with calibrated flow controllers provided by the lab. Each Summa canister was fitted with its own 1-hour flow controller.

The Modified EPA Method 16A sampling train consisted of:

- Unheated Teflon tubing fitted on to the pipe port.
- Dilution air (N_2) introduced via heated sample line into the Teflon tubing, downstream from the connection to the pipe port.
- The temperature of the mass flow controller (MFC) was measured by attaching a thermocouple to the exit of the MFC; temperature was recorded every 5-10 minutes during each run.
- Three chilled, empty impingers were added for moisture removal.
- The volume of water collected in the impingers was measured and recorded.

6.1.3 Sampling Notes: During the EPA Method 308 testing on April 8, 2014 on Sampling Point 1A, the liter meter was not operating properly and the testers stopped to unclog the meter several times each during Runs 1 and 3. After Run 3, the testers discovered that the liter meter had an internal stainless steel filter that was clogged. The meter was taken out of service and another meter was used for the remainder of the testing. The operation of this meter should have no significant effect on the results for Runs 1 and 3 because the meter was stopped and serviced every time it showed a high vacuum indicating a clog.

On April 10, 2014 during the EPA Method 308 methanol sample recovery for Sample Point 1B Run 2, the tester inadvertently spilled a small amount of the sample. The tester had already measured the weight of both sample impingers and had poured the contents into two sample jars. The sample jar for the second impinger was accidentally knocked over before it was sealed. About one-third of this sample jar's contents were lost. Zach Hedgpeth of EPA was present during this event, and he discussed this with Joseph Heffernan of Horizon Engineering. Mr. Hedgpeth did not consider it a significant loss because a small volume was lost and because it was the contents of the second impinger. The majority of the methanol in the exhaust should be captured in the first impinger and only the breakthrough would be found in the second impinger. Therefore Mr. Hedgpeth did not advise Horizon Engineering to repeat the run. The results were calculated with the actual sample volume sent to the laboratory and the actual laboratory results (without any adjustment).

On April 8, 2014, the Summa canister for Run 1 on Sampling Point 1A was inadvertently attached to the sample line without a flow controller, causing the sample to flow into the canister without restriction. The tester aborted the run and disconnected this Summa canister. This canister was returned to the laboratory, without analysis. Another canister was attached properly and the run was started again.

On April 9, 2014, during EPA Method 308 Run 2 on Sampling Point 2A, there was a problem with the Washer process, causing the metering screw rate for the digester to drop from 13 rpm to 4 rpm. Zach Hedgpeth of EPA was present during the event and advised the testers to continue testing. The results were calculated using this lower production rate obtained by the process, as requested by Mr. Hedgepeth.

According to the source test plan, moisture was to be measured by psychrometry method. Wet bulb / dry bulb measurements were taken every 5 to 10 minutes. All of the readings taken were between 210 °F and 212 °F, indicating that the exhaust gas was mainly steam. The psychrometric method does not apply to steam. Therefore the moisture of the exhaust gas, used to calculate flow rates, was measured using the moisture catch collected in the sample train impingers for both the EPA Method 308 and EPA Method 16A sampling.

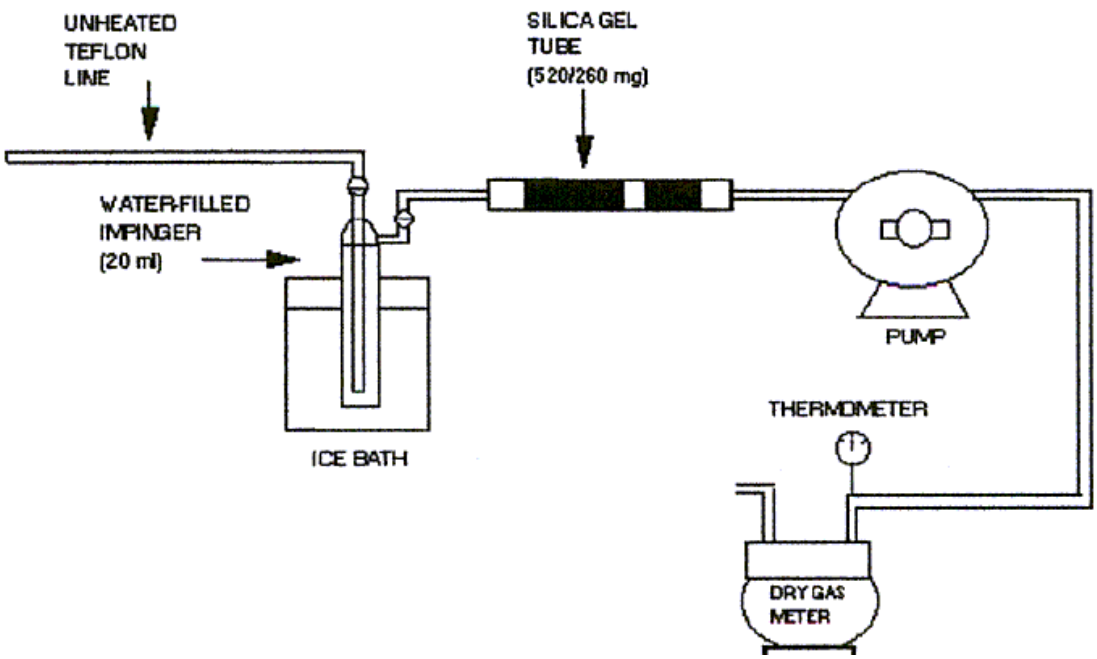
Flow was measured from the side sample port installed by Clearwater and modified by Horizon personnel with a wider diameter pipe adapter fitted to the outside of the flow port. It was determined before testing began that an S-type pitot was best for the testing and this was used by the testers. However, the port diameter was not large enough to fit the S-type pitot equipped with a thermocouple. Therefore the exhaust temperatures were measured separately, with the wet bulb / dry bulb measurements.

6.1.4 Laboratory Analysis:

Analyte	**Laboratory**
Methanol	ALS Environmental, Kelso, Washington
TRS Compounds	ALS Environmental. Simi Valley, California

6.2 Sampling Train Diagrams:

Figure 10
EPA Method 308 Methanol - Sample Train Diagram



6.2.1 Diagram Exceptions:

- Standard size impingers instead of midgets
- Stainless steel fitting at stack interface and impinger outlet
- Two additional standard size impingers for moisture removal

Figure 11

Combined EPA Methods 16A & 6C TRS Sample Train Diagram Modified for Testing (See Below)

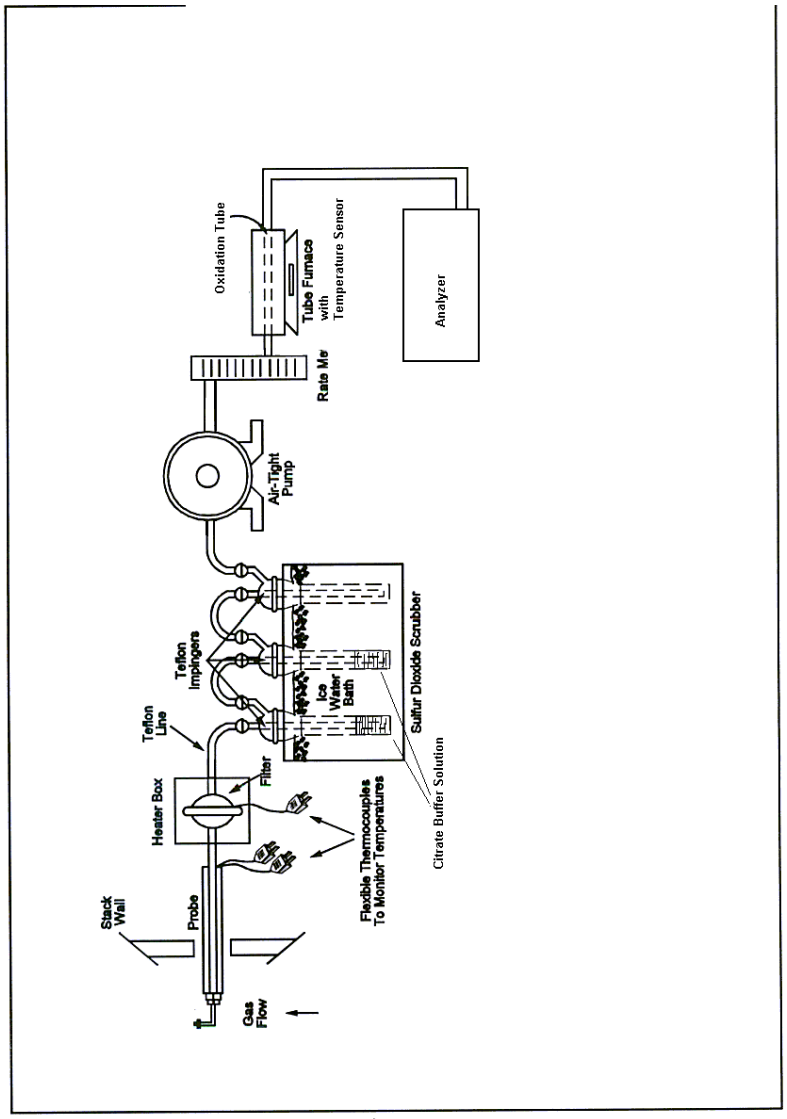


Figure 16A-1. Sampling Train.

6.2.1 Diagram Exceptions:

- The heated probe, heated box, pump, tube furnace and analyzer were not used
- An unheated Teflon probe was used
- A flow controller and Summa canister was added to the end of the train, for sample collection

6.3 Horizon Test Equipment:

6.3.1 Manual Methods:

Equipment Name	Identification
Non-Isokinetic Meters	CAE Express (Liter meters with internal pumps), Horizon No. LMB 1, LMB 3
Pitot and Thermocouple	SR 36-2
Shortridge® Micromanometer	SR-4
Barometer	Calibrated Barometer

7. DISCUSSION

The testing met the requirements specified in the EPA Request for Information (RFI) dated July 19, 2013, and modified by EPA and Clearwater Paper prior to the test. The report includes allowed modifications to test methods that were made to meet the challenges presented by the Sawdust Digester process equipment.

The results of the testing should be valid, with exceptions to the process and sampling that occurred during the test described within the report. All quality assurance checks including leak checks, instrument checks, and calibrations, were within modified method-allowable tolerances.

APPENDIX

Abbreviations & Acronyms

Abbreviations and Acronyms Used in the Report

AAC	Atmospheric Analysis & Consulting, Inc.
ACDP	Air Contaminant Discharge Permit
ADEC	Alaska Department of Environmental Conservation
ADL	Above Detection Limit
BAAQMD	Bay Area Air Quality Management District
BACT	Best Achievable Control Technology
BCAA	Benton Clean Air Agency
BDL	Below Detection Limit
BHP	Boiler Horsepower
BIF	Boiler and Industrial Furnace
BLS	Black Liquor Solids
C	Carbon
C_3H_8	Propane
CAS	Columbia Analytical Laboratory
CEM	Continuous Emissions Monitor
CEMS	Continuous Emissions Monitoring System
CERMS	Continuous Emissions Rate Monitoring System
CET	Calibration Error Test
CFR	Code of Federal Regulations
CGA	Cylinder Gas Audit
CH_2O	Formaldehyde
CH_4	Methane
Cl_2	Chlorine
ClO_2	Chlorine Dioxide
CNCG	Concentrated Non-Condensable Gas
CO	Catalytic Oxidizer
CO_2	Carbon Dioxide
COC	Chain of Custody
CTM	Conditional Test Method
CTO	Catalytic Thermal Oxidizer
Dioxins	Polychlorinated Dibenzo-p-dioxins (PCDD's)
DLL	Detection Level Limited
DNCG	Dilute Non-Condensable Gas
dscf	Dry Standard Cubic Feet
EIT	Engineer in Training
EPA	Environmental Protection Agency
ESP	Electrostatic Precipitator
EU	Emission Unit
FID	Flame Ionization Detector
Furans	Polychlorinated Dibenzofurans (PCDF's)
GC	Gas Chromatography
gr/dscf	Grains Per Dry Standard Cubic Feet
H_2S	Hydrogen Sulfide
HAP	Hazardous Air Pollutant
HCl	Hydrogen Chloride
HHV	Higher Heating Value
HRSG	Heat Recovery Steam Generator
IDEQ	Idaho Department of Environmental Quality
lb/hr	Pounds Per Hour
LHV	Lower Heating Value
LRAPA	Lane Regional Air Protection Agency
MACT	Maximum Achievable Control Technology
MDI	Methylene Diphyenyl Diisocyanate
MDL	Method Detection Limit
MEK	Methyl Ethyl Ketone
MeOH	Methanol
MMBtu	Million British Thermal Units
MRL	Method Reporting Limit
MS	Mass Spectrometry
MSF	Thousand Square Feet
NCASI	National Council for Air and Steam Improvement

Abbreviations and Acronyms Used in the Report

NCG	Non-condensable Gases
NCUAQMD	North Coast Unified Air Quality Management District
NDIR	Non-dispersive Infrared
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NMC	Non-Methane Cutter
NMVOC	Non-Methane Volatile Organic Compounds
NWCAA	Northwest Clean Air Agency
NO_x	Nitrogen Oxides
NPD	Nitrogen Phosphorus Detector
O_2	Oxygen
ODEQ	Oregon Department of Environmental Quality
ORCAA	Olympic Region Clean Air Agency
PAHs	Polycyclic Aromatic Hydrocarbons
PCWP	Plywood and Composite Wood Products
PE	Professional Engineer
PM	Particulate Matter
ppbv	Parts Per Billion by Volume
ppmv	Parts Per Million by Volume
PS	Performance Specification
PSCAA	Puget Sound Clean Air Agency
PSEL	Plant Site Emission Limits
psi	pounds per square inch
PTE	Permanent Total Enclosure
PST	Performance Specification Test
PTM	Performance Test Method
QA/QC	Quality Assurance and Quality Control
QSTI	Qualified Source Testing Individual
RA	Relative Accuracy
RAA	Relative Accuracy Audit
RACT	Reasonably Available Control Technology
RATA	Relative Accuracy Test Audit
RCTO	Rotary Concentrator Thermal Oxidizer
RM	Reference Method
RTO	Regenerative Thermal Oxidizer
SCD	Sulfur Chemiluminescent Detector
SCR	Selective Catalytic Reduction System
SO_2	Sulfur Dioxide
SOG	Stripper Off-Gas
SRCAA	Spokane Regional Clean Air Agency
SWCAA	Southwest Clean Air Agency
TAP	Toxic Air Pollutant
TCA	Thermal Conductivity Analyzer
TCD	Thermal Conductivity Detector
TGNENMOC	Total Gaseous Non-Ethane Non-Methane Organic Compounds
TGNMOC	Total Gaseous Non-Methane Organic Compounds
TGOC	Total Gaseous Organic Compounds
THC	Total Hydrocarbon
TIC	Tentatively Identified Compound
TO	Thermal Oxidizer
TO	Toxic Organic (as in EPA Method TO-15)
TPH	Tons Per Hour
TRS	Total Reduced Sulfur
TTE	Temporary Total Enclosure
VE	Visible Emissions
VOC	Volatile Organic Compounds
WC	Inches Water Column
WDOE	Washington Department of Ecology

Nomenclature

NOMENCLATURE

Constants	Value	Units	Definition	Ref
Pstd(1)	29.92126	inHg	Standard Pressure	CRC
Pstd(2)	2116.22	lbf / ft²		CRC
Tstd	527.67	°R	Standard Temperature	CRC
R	1545.33	ft lbf / lbmol °R	Ideal Gas Constant	CRC
MW-atm	28.96456422	lbm / lbmole	Atmospheric (20.946 %O_2, 0.033% CO_2, Balance N_2+Ar)	
MW-C	12.011	lbm / lbmole	Carbon	CRC
MW-CO	28.0104	lbm / lbmole	Carbon Monoxide	CRC
MW-CO_2	44.0098	lbm / lbmole	Carbon Dioxide	CRC
MW-H_2O	18.01534	lbm / lbmole	Water	CRC
MW-NO_2	46.0055	lbm / lbmole	Nitrogen Dioxide	CRC
MW-O_2	31.9988	lbm / lbmole	Oxygen	CRC
MW-SO_2	64.0628	lbm / lbmole	Sulfur Dioxide	CRC
MW-N_2+Ar	28.15446807	lbm / lbmole (Balance with 98.82% N_2 & 1.18% Ar)	Emission balance	
C1	385.3211297	ft³ / lbmol	Ideal Gas Constant @ Standard Conditions	
C2	816.5455228	inHg in²/ °R ft²	Isokentics units correction constant	
Kp	5129.4	ft / min [(inHg lbm/mole) / (°R inH$_2$O)] ^½	Pitot tube constant	Ref 2.5.1

Symbol	Units	Definition	Calculating Equation or Source of Data	EPA
As	in²	Area, Stack		
An	in²	Area, Nozzle		
Bws	%	Moisture, % Stack gas	[100 Vw(std) / [Vw(std)+Vm(std)]]	Eq. 5-3
C	ppmv-C	Carbon (General Reporting Basis for Organics)		
C1	ft³/lbmol	Gas Constant @ Standard Conditions	[R Tstd / Pstd(2)]	
C2	inHg in²/ °R ft²		[14,400 Pstd / Tstd]	
Cd	lbm-GAS / MMdscf	Mass of gas per unit volume	[Cgas MWgas / C1]	
cg	gr/dscf	Grain Loading, Actual	[15.432 mn / Vm(std) 1,000]	Eq. 5-6
cg @ X%CO_2	gr/dscf	Grain Loading Corrected to X% Carbon Dioxide	[X% / CO_2%]	
cg @ X%O_2	gr/dscf	Grain Loading Corrected to X% Oxygen	[(20.946-X) / (20.946-O_2)]	
Cgas	ppmv, %	Gas Concentration, (Corrected)		
Cgas @ X%CO_2	ppmv	Gas Concentration Correction to X% Carbon Dioxide	[X% / CO_2%]	
Cgas @ X%O_2	ppmv	Gas Concentration Correction to X% Oxygen	[(20.946-X%) / (20.946-O_2%)]	
Cgas	ppmv		Mgas (lbm/hr) * 1,000,000*385.3211/60*Qsd*mw	
CO	ppmv	Carbon Monoxide		
Co	ft	Outer Circumference of Circular Stack		
Ci	ft	Inner Circumference of Circular Stack		
CO_2	%	Carbon Dioxide		
Cp		Pitot tube coefficient		
Ct	lb/hr	Particulate Mass Emissions	[60 cg Qsd/ 7,000]	
dH	in H_2O	Pressure differential across orifice		
Dn	in	Diameter, Nozzle		
dp^½		Average square root of velocity pressure		
Ds	in	Diameter, Stack		
E	lb / MMBtu	Pollutant Emission Rate	Cgas Fd MWgas (20.946 / (20.946-O_2)) / (1,000,000 C1)	
Fd	dscf / MMBtu	F Factor for Various Fuels		Table 19-1
I	%	Percent Isokinetic	[C2 Ts(abs) Vm(std) / (vs Ps mfg An Ø)]	Eq. 5-8*
Md	lbm / lbmole	Molecular weight, Dry Stack Gas	[(1-%O_2-%CO_2)(MWn2+ar)+(%O_2 MW-O_2)+(%CO_2 MW-CO_2)]	Eq. 3-1*
mfg		Mole fraction of dry stack gas	[1-Bws/100]	
Mgas	lbm/hr	Gaseous Mass Emisisons	[60 Cgas(ppmv) MW Pstd(2) Qsd / 1,000,000 R Tstd]	
mn	mg	Particulate lab sample weight		
Ms	lbm / lbmole	Molecular weight, Wet Stack	[Md mfg +MW-H_2O (1-mfg)]	Eq. 2-5
MW	lbm / lbmole	Molecular Weight		
NO_2	ppmv-NO_2	Nitrogen Dioxide (General Reporting Basis for NOx)		
NOx	ppmv-NO_2	Nitrogen Oxides (Reported as NO_2)		
O_2	%	Oxygen		
OPC	%	Opacity		
Pbar	in Hg	Pressure, Barometric		
Pg	in H_2O	Pressure, Static Stack		
Po	in Hg	Pressure, Absolute across Orifice	[Pbar + dH / 13.5951]	
Ps	in Hg	Pressure, Absolute Stack	[Pbar + Pg / 13.5951]	Eq. 2-6*
Qa	acf/min	Volumetric Flowrate, Actual	[As vs / 144]	
Qsd	dscf/min	Volumetric Flowrate, Dry Standard	[Qa Tstd mfg Ps] / [Pstd(1) Ts(abs)]	Eq 2-10*
Rf	MMBtu/hr		1,000,000 Mgas (20.946-O_2)] / [Cd Fd 20.946]	
SO_2	ppmv-SO_2	Sulfur Dioxide		
t	in	Wall thickness of a stack or duct		
TGOC	ppmv-C	Total Gaseous Organic Concentration (Reported as C)		
Tm	°F	Temperature, Dry gas meter		
Tm(abs)	ºR	Temperature, Absolute Dry Meter	[Tm + 459.67]	
Ts	°F	Temperature, Stack gas		
Ts(abs)	ºR	Temperature, Absolute Stack gas	[Ts + 459.67]	
Vlc	ml	Volume of condensed water		
Vm	dcf	Volume, Gas sample		
Vm(std)	dscf	Volume, Dry standard gas sample	[Y Vm Tstd Po]/ [Pstd(1) Tm(abs)]	Eq. 5-1
vs	fpm	Velocity, Stack gas	Kp Cp dp^½ [Ts(abs) / (Ps Ms)]^ ½	Eq. 2-9*
Vw(std)	scf	Volume, Water Vapor	0.04707 Vlc	Eq. 5-2
Y		Dry gas meter calibration factor		Fig. 5.6
Ø	min	Time, Total sample		

* Based on equation.

Methanol

Results and Sample Calculations
Methanol Field Data
Flow Rate Field Data
TRS Summa Canister & Moisture Field Data
Methanol Sample Recovery Field Data & Worksheets
Laboratory Results & COC
Traverse Point Locations

Flow Rate and Methanol Results

Client	Clearwater Paper Corp.				4/8/14	Date
Source	M & D Digester #1-pt1A				JH	Operator
Location	Lewiston, ID				MEW	Analyist/QA
Definitions	Symbol		1	2	3	
			8:07	9:58	11:40	
			9:27	10:58	13:09	
Dry Air supply		lpm	0.50	0.50	0.50	0.50
		L	30.00	30.00	31.50	30.50
		Tdas	86.8	89.3	92.5	89.6
		dsl	**28.66**	**28.52**	**29.78**	**28.99**
Dry gas meter		Liters	60.250	60.100	59.000	59.783
Volume, Gas sample	Vm	dcf	2.128	2.122	2.084	2.111
Temperature, Dry gas meter	Tm	°F	85.79	91.63	96.13	91.18
Temperature, Stack gas	Ts	°F	210.0	211.0	211.0	210.7
Temperature, Stack Dry Bulb	Tdb	°F	210.0	211.0	211.0	210.7
Temperature, Stack Wet Bulb	Twb	°F	210.0	211.0	211.0	210.7
Average square root velocity pressure	dp^½	in H2O^½	0.589	0.646	0.545	0.593
Pitot tube coefficient	Cp		0.8258	0.8258	0.8258	0.8258
Dry gas meter calibration factor	Y		0.99559	0.99559	0.99559	0.99559
Pressure, Barometric	Pbar	in Hg	29.60	29.60	29.60	29.60
Pressure, Static Stack	Pg	in H2O	-0.1825	-0.1920	-0.1630	-0.1792
Time, Total sample	Ø	min	60	60	63	61
Stack Area	As	in²	56.7	56.7	56.7	56.7
Volume of condensed water	Vlc	ml	902.4	1015.0	879.6	932.3
Oxygen		% O2	20.95	20.95	20.95	20.95
Carbon Dioxide		% CO2	0.03	0.03	0.03	0.03
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96
Pressure, Absolute Stack	Ps	in Hg	29.59	29.59	29.59	29.59
Pressure, avg arcoss orifice	Po	in Hg	29.60	29.60	29.60	29.60
Volume, Dry standard gas sample	Vm(std)	dscf	2.03	2.00	1.95	1.99
Volume, Dry standard gas sample		dsl	**57.40**	**56.66**	**55.17**	**56.41**
Volume, Dry standard gas sample		dsl/min	0.96	0.94	0.88	0.93
Volume, Water Vapor	Vw(std)	scf	**42.47**	**47.78**	**41.40**	**43.88**
Volume, Water Vapor		sl	1,202.7	1,352.9	1,172.3	1,242.6
Volume, Water Vapor		sl/min	1.33	1.33	1.33	1.33
Moisture, % Stack (EPA 4)	Bws(1)	%	95.44	95.98	95.51	95.64
Moisture, % Stack (Psychrometry-Sat)	Bws(2)	%	97.18	99.14	99.13	98.49
Moisture, % Stack (Psychrometry)	Bws(4)	%	97.18	99.14	99.13	98.49
Moisture, % Stack (CALCULATED)	Bws(5)	%	97.67	97.96	97.88	97.84
Mole Fraction dry Gas	mfg		2.33%	2.04%	2.12%	2.16%
Molecular weight, Wet Stack	Ms	lbm / lbmole	18.27	18.24	18.25	18.25
Velocity, Stack gas	vs	fpm	2,779	3,049	2,574	2,801
Volumetric Flowrate, Actual	Qa	acf/min	1095.0	1201.6	1014.4	1103.7
Volumetric Flowrate, Dry Standard	Qsw	wscf/min	853.2	934.8	789.2	859.1
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	19.92	19.04	16.73	18.56

Volumetric Stack Sample		dsl	**28.75**	**28.13**	**25.39**	**27.42**
		dscf	**1.02**	**0.99**	**0.90**	**0.97**
Volumetric Stack Sample Dilution			2.00	2.01	2.17	2.06

METHANOL

Impinger		**ug**	19,000	20,000	20,000	19,667
Silica Gel Tube Front		**ug**	580	840	1,700	1,040
Silica Gel Tube Back		**ug**	440	630	1,100	723
Total		**ug**	20,020	21,470	22,800	21,430
TOTAL SAMPLE VOLUME		**ml**	1,061	1,115	952	1,043
ALIQUET		**ml**	42.58	42.58	42.68	42.61
Dilution Factor			24.91	26.20	22.32	24.48
Corrected Sample Mass	mn	mg	498.7	562.4	508.9	523.3
Grain Loading, Actual	cg	gr / dscf	7.580	8.737	8.759	8.359
		mg / dscm	17,347	19,992	20,043	19,127
		ppmv(wet)	304	306	319	310
		ppmv(dry)	13,024	15,010	15,048	14,360
	Ct	lbm / hr	1.2942	1.4260	1.2560	1.3254
		gm / hr	587.0	646.8	569.7	601.2
		ODTP/DAY	**242.7**	**244.8**	**244.4**	**244.0**
Production Pulp		ODT/hr	10.11	10.20	10.18	10.17
		lbm-MeOH/ODTP	0.1280	0.1398	0.1233	0.1304

TOTAL METHANOL (MD1)		lbm / hr	3.129	2.883	2.531	2.848
		gm / hr	1,419	1,308	1,148	1,292
		lbm-MeOH/ODTP	0.305	0.296	0.243	0.281
TOTAL METHANOL (MD2)		lbm / hr	3.319	3.572	3.292	3.394
		gm / hr	1,505	1,620	1,493	1,540
		lbm-MeOH/ODTP	0.370	0.401	0.369	0.380

md_1_pt_1A.xls

Flow Rate and TRS Results

Client	Clearwater Paper Corp.				4/8/14	Date
Source	M & D Digester #1-pt1A				JH	Operator
Location	Lewiston, ID				MEW	Analyist/QA
Definitions	Symbol					
			14:03	15:18	16:38	
			15:03	16:18	17:38	
Summa Can Id.			ssc00224	ssc00231	ssc00228	
Summa Can Initial Pressure		psig	-14.30	-14.30	-14.30	
Summa Can Final Pressure		psig	-1.65	-1.90	-1.76	
Difference			12.65	12.40	12.54	
Percent Volume			0.86	0.84	0.85	
Sample Volume		L	**5.16**	**5.06**	**5.12**	
Dry Air supply		lpm	0.08	0.08	0.08	0.08
		L	4.80	4.80	4.80	4.80
		Tdas	98.0	101.4	104.3	101.2
		dsl	**4.49**	**4.47**	**4.44**	**4.47**
Temperature, Stack gas	Ts	°F	212.0	212.0	212.0	212.0
Temperature, Stack Dry Bulb	Tdb	°F	212.0	212.0	212.0	212.0
Temperature, Stack Wet Bulb	Twb	°F	212.0	212.0	212.0	212.0
Average square root velocity pressure	dp^½	in H2O^½	0.538	0.520	0.484	0.514
Pitot tube coefficient	Cp		0.8258	0.8258	0.8258	0.8258
Pressure, Barometric	Pbar	in Hg	29.60	29.60	29.60	29.60
Pressure, Static Stack	Pg	in H2O	-0.1250	-0.1790	-0.2265	-0.1768
Time, Total sample	Ø	min	60	60	60	60
Stack Area	As	in²	56.7	56.7	56.7	56.7
Volume of condensed water	Vlc	ml	33.1	29.0	48.0	36.7
Oxygen		% O2	20.95	20.95	20.95	20.95
Carbon Dioxide		% CO2	0.03	0.03	0.03	0.03
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96
Pressure, Absolute Stack	Ps	in Hg	29.59	29.59	29.58	29.59
Pressure, avg arcoss orifice	Po	in Hg	29.60	29.60	29.60	29.60
Volume, Dry standard gas sample	Vm(std)	dscf	0.18	0.18	0.18	0.18
Volume, Dry standard gas sample (LAB)		dsl	**5.16**	**5.06**	**5.12**	**5.12**
Volume, Dry standard gas sample		dsl/min	0.09	0.08	0.09	0.09
Volume, Water Vapor	Vw(std)	scf	1.56	1.37	2.26	1.73
Volume, Water Vapor		sl	44.1	38.7	64.0	48.9
Volume, Water Vapor		sl/min	1.33	1.33	1.33	1.33
Moisture, % Stack (EPA 4)	Bws(1)	%	89.52	88.42	92.59	90.18
Moisture, % Stack (Psychrometry-Sat)	Bws(2)	%	101.11	101.13	101.14	101.13
Moisture, % Stack (Psychrometry)	Bws(4)	%	101.11	101.13	101.14	101.13
Moisture, % Stack (CALCULATED)	Bws(5)	%	98.50	98.48	98.95	98.64
Mole Fraction dry Gas	mfg		1.50%	1.52%	1.05%	1.36%
Molecular weight, Wet Stack	Ms	lbm / lbmole	18.18	18.18	18.13	18.16
Velocity, Stack gas	vs	fpm	2,549	2,460	2,294	2,435
Volumetric Flowrate, Actual	Qa	acf/min	1004.3	969.6	904.2	959.4
Volumetric Flowrate, Dry Standard	Qsw	wscf/min	780.3	753.2	702.3	745.3
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	11.70	11.46	7.35	10.17
Volumetric Stack Sample		dsl	**0.67**	**0.60**	**0.68**	**0.65**
		dscm	0.000672	0.000597	0.000677	0.000649
		dscf	0.0237	0.0211	0.0239	0.0229
Volumetric Stack Sample Dilution			7.69	8.48	7.56	7.91

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Clearwater Paper Corp.
M & D Digester #1-pt1A

April 8, 2014
JH
MEW

HYDROGEN SULFIDE		ug/m3	13,000	8,400	17,000	12,800
		dscm	0.0052	0.0051	0.0051	0.0051
Total		ug	67.14	42.53	87.04	65.57
CORRECTED CONCENTRATION		ug/m3	99,964	71,228	128,595	99,929
Corrected Sample Mass	mn	mg	0.0671	0.0425	0.0870	0.0656
Grain Loading, Actual	cg	gr / dscf	0.0437	0.0311	0.0562	0.0437
		mg / dscm	99.96	71.23	128.60	99.93
		ppmv(wet)	1.1	0.8	1.0	0.9
		ppmv(dry)	70.6	50.3	90.8	70.5
METHYL MERCAPTAN		ug/m3	1,800,000	1,300,000	1,900,000	1,666,667
		dscm	0.0052	0.0051	0.0051	0.0051
Total		ug	9,296.41	6,581.38	9,727.54	8,535.11
CORRECTED CONCENTRATION		ug/m3	13,841,101	11,023,387	14,372,420	13,078,969
Corrected Sample Mass	mn	mg	9.2964	6.5814	9.7275	8.5351
Grain Loading, Actual	cg	gr / dscf	6.0485	4.8172	6.2807	5.7154
		mg / dscm	13,841.08	11,023.37	14,372.40	13,078.95
		ppmv(wet)	103.8	83.8	75.2	87.6
		ppmv(dry)	6,920.5	5,511.7	7,186.2	6,539.5
DIMETHYL SULFIDE		ug/m3	12,000,000	8,000,000	11,000,000	10,333,333
		dscm	0.0052	0.0051	0.0051	0.0051
Total		ug	61,976	40,501	56,317	52,931
CORRECTED CONCENTRATION		ug/m3	92,274,004	67,836,230	83,208,750	81,106,328
Corrected Sample Mass	mn	mg	61.98	40.50	56.32	52.93
Grain Loading, Actual	cg	gr / dscf	40.32	29.64	36.36	35.44
		mg / dscm	92,274	67,836	83,209	81,106
		ppmv(wet)	535.7	399.5	337.2	424.2
		ppmv(dry)	35,725.9	26,264.3	32,216.1	31,402.1
DIMETHYL DISULFIDE		ug/m3	220,000	170,000	260,000	216,667
		dscm	0.0052	0.0051	0.0051	0.0051
Total		ug	1,136	861	1,331	1,109
CORRECTED CONCENTRATION		ug/m3	1,691,690	1,441,520	1,966,752	1,699,987
Corrected Sample Mass	mn	mg	1.1362	0.8606	1.3311	1.1093
Grain Loading, Actual	cg	gr / dscf	0.7393	0.6299	0.8595	0.7429
		mg / dscm	1,691.69	1,441.52	1,966.75	1,699.98
		ppmv(wet)	6.5	5.6	5.3	5.8
		ppmv(dry)	432.0	368.1	502.2	434.1

Flow Rate and Methanol Results

Client	Clearwater Paper Corp.				4/9/14	Date
Source	M & D Digesters 1 - pt2A				JH	Operator
Location	Lewiston, ID				MEW	Analyist/QA
Definitions	Symbol		1	2	3	
			8:45	10:08	12:26	
			9:45	11:08	13:26	
Dry Air supply		lpm	0.50	0.50	0.50	0.50
		L	30.00	30.00	30.00	30.00
		Tdas	91.8	90.9	92.6	91.8
		dsl	**29.07**	**29.12**	**29.03**	**29.07**
Dry gas meter		Liters	60.169	60.061	60.225	60.152
Volume, Gas sample	Vm	dcf	2.125	2.121	2.127	2.124
Temperature, Dry gas meter	Tm	°F	89.92	91.75	91.75	91.14
Temperature, Stack gas	Ts	°F	212.0	212.0	212.0	
Temperature, Stack Dry Bulb	Tdb	°F	212.0	212.4	213.0	212.5
Temperature, Stack Wet Bulb	Twb	°F	211.0	211.4	212.0	211.5
Average square root velocity pressure	dp^½	in H2O^½	0.703	0.581	0.569	0.618
Pitot tube coefficient	Cp		0.8258	0.8258	0.8258	0.8258
Dry gas meter calibration factor	Y		0.98847	0.98847	0.98847	0.98847
Pressure, Barometric	Pbar	in Hg	30.30	30.30	30.30	30.30
Pressure, Static Stack	Pg	in H2O	-0.1652	-0.1209	-0.1642	-0.1501
Time, Total sample	Ø	min	60	60	60	60
Stack Area	As	in²	56.7	56.7	56.7	56.7
Volume of condensed water	Vlc	ml	832.4	1006.2	860.5	899.7
Oxygen		% O2	20.95	20.95	20.95	20.95
Carbon Dioxide		% CO2	0.03	0.03	0.03	0.03
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96
Pressure, Absolute Stack	Ps	in Hg	30.29	30.29	30.29	30.29
Pressure, avg arcoss orifice	Po	in Hg	30.30	30.30	30.30	30.30
Volume, Dry standard gas sample	Vm(std)	dscf	2.04	2.03	2.04	2.04
Volume, Dry standard gas sample		dsl	**57.83**	**57.53**	**57.69**	**57.68**
Volume, Dry standard gas sample		dsl/min	0.96	0.96	0.96	0.96
Volume, Water Vapor	Vw(std)	scf	39.18	47.36	40.50	42.35
Volume, Water Vapor		sl	1,109.4	1,341.1	1,147.0	1,199.2
Volume, Water Vapor		sl/min	1.33	1.33	1.33	1.33
Moisture, % Stack (EPA 4)	Bws(1)	%	95.05	95.89	95.21	95.38
Moisture, % Stack (Psychrometry-Sat)	Bws(2)	%	98.79	98.78	98.79	98.78
Moisture, % Stack (Psychrometry)	Bws(4)	%	96.84	97.66	98.79	97.76
Moisture, % Stack (CALCULATED)	Bws(5)	%	97.47	97.93	97.56	97.65
Mole Fraction dry Gas	mfg		2.53%	2.07%	2.44%	2.35%
Molecular weight, Wet Stack	Ms	lbm / lbmole	18.29	18.24	18.28	18.27
Velocity, Stack gas	vs	fpm	3,279	2,713	2,657	2,883
Volumetric Flowrate, Actual	Qa	acf/min	1292.3	1069.2	1046.9	1136.1
Volumetric Flowrate, Dry Standard	Qsw	wscf/min	1027.7	850.3	832.5	903.5
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	25.96	17.64	20.30	21.30
Volumetric Stack Sample		dsl	**28.75**	**28.42**	**28.66**	
		dscf	1.02	1.00	1.01	
Volumetric Stack Sample Dilution			2.01	2.02	2.01	

METHANOL

Impinger		**ug**	23,000	23,000	20,000	22,000
Silica Gel Tube Front		**ug**	1,100	1,100	940	1,047
Silica Gel Tube Back		**ug**	840	800	750	797
Total		**ug**	24,940	24,900	21,690	23,843
TOTAL SAMPLE VOLUME		**ml**	926	1,064	933	974
ALIQUET		**ml**	42.58	42.27	42.07	42.31
Dilution Factor			21.75	25.17	22.16	23.03
Corrected Sample Mass	mn	mg	542	627	481	550.0
Grain Loading, Actual	cg	gr / dscf	8.244	9.638	7.330	8.404
		mg / dscm	18,865	22,055	16,774	19,231
		ppmv(wet)	358	344	307	336
		ppmv(dry)	14,163	16,558	12,593	14,438
	Ct	lbm / hr	1.8346	1.4575	1.2752	1.5224
		gm / hr	832.2	661.1	578.4	690.6
		ODTP/DAY	**249.1**	**224.2**	**254.7**	**242.7**
Production Pulp		ODT/hr	10.4	9.3	10.6	10.1
		lbm-MeOH/ODTP	0.1768	0.1560	0.1202	0.1510

md_1_pt_2A.xls

Flow Rate and TRS Results

Client	Clearwater Paper Corp.				4/9/14	Date
Source	M & D Digesters 1 - pt2A				JH	Operator
Location	Lewiston, ID				MEW	Analyist/QA
Definitions	Symbol					
			13:40	14:47	15:55	
			14:40	15:47	16:55	
Summa Can Id.			ssc00213	ssc00092	ssc00229	
Summa Can Initial Pressure		psig	-14.30	-14.30	-14.30	
Summa Can Final Pressure		psig	-1.04	-0.47	-1.49	
Difference			13.26	13.83	12.81	
Percent Volume			0.90	0.94	0.87	
Sample Volume		L	**5.41**	**5.65**	**5.23**	
Dry Air supply		lpm	0.08	0.08	0.08	0.08
		L	4.80	4.80	4.80	4.80
		Tdas	94.0	90.9	91.9	92.2
		dsl	**4.63**	**4.66**	**4.65**	**4.65**
Temperature, Stack gas	Ts	°F	212.0	212.0	212.0	212.0
Temperature, Stack Dry Bulb	Tdb	°F	212.0	212.0	212.0	212.0
Temperature, Stack Wet Bulb	Twb	°F	211.0	211.0	211.0	211.0
Average square root velocity pressure	dp^½	in H2O^½	0.589	0.660	0.602	0.617
Pitot tube coefficient	Cp		0.8258	0.8258	0.8258	0.8258
Pressure, Barometric	Pbar	in Hg	30.30	30.30	30.30	30.30
Pressure, Static Stack	Pg	in H2O	-0.1650	-0.1008	-0.1501	-0.1386
Time, Total sample	Ø	min	60	60	60	60
Stack Area	As	in²	56.7	56.7	56.7	56.7
Volume of condensed water	Vlc	ml	51.9	130.3	37.0	73.1
Oxygen		% O2	20.95	20.95	20.95	20.95
Carbon Dioxide		% CO2	0.03	0.03	0.03	0.03
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96
Pressure, Absolute Stack	Ps	in Hg	30.29	30.29	30.29	30.29
Pressure, avg arcoss orifice	Po	in Hg	30.30	30.30	30.30	30.30
Volume, Dry standard gas sample	Vm(std)	dscf	0.19	0.20	0.18	0.19
Volume, Dry standard gas sample (LAB)		dsl	**5.41**	**5.65**	**5.23**	**5.43**
Volume, Dry standard gas sample		dsl/min	0.09	0.09	0.09	0.09
Volume, Water Vapor	Vw(std)	scf	2.44	6.13	1.74	3.44
Volume, Water Vapor		sl	69.2	173.7	49.3	97.4
Volume, Water Vapor		sl/min	1.33	1.33	1.33	1.33
Moisture, % Stack (EPA 4)	Bws(1)	%	92.74	96.85	90.41	93.34
Moisture, % Stack (Psychrometry-Sat)	Bws(2)	%	98.79	98.77	98.78	98.78
Moisture, % Stack (Psychrometry)	Bws(4)	%	96.84	96.83	96.84	96.84
Moisture, % Stack (CALCULATED)	Bws(5)	%	98.88	99.43	98.84	99.05
Mole Fraction dry Gas	mfg		1.12%	0.57%	1.16%	0.95%
Molecular weight, Wet Stack	Ms	lbm / lbmole	18.14	18.08	18.14	18.12
Velocity, Stack gas	vs	fpm	2,761	3,098	2,821	2,893
Volumetric Flowrate, Actual	Qa	acf/min	1087.8	1220.6	1111.6	1140.0
Volumetric Flowrate, Dry Standard	Qsw	wscf/min	865.1	970.8	884.0	906.6
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	9.66	5.49	10.27	8.47
Volumetric Stack Sample		dsl	**0.78**	**0.99**	**0.58**	**0.78**
		dscm	0.000781	0.000987	0.000579	0.000783
		dscf	0.0276	0.0349	0.0205	0.0276
Volumetric Stack Sample Dilution			6.93	5.72	9.03	7.22

md_1_pt_2A.xls

Clearwater Paper Corp.
M & D Digesters 1 - pt2A

4/9/2014
JH
MEW

HYDROGEN SULFIDE		ug/m3	20,000	*1,800*	18,000	13,267
		dscm	0.0054	*0.0056*	0.0052	0.0054
Total		ug	108.27	*10.16*	94.14	70.86
CORRECTED CONCENTRATION		ug/m3	138,597	10,292	162,451	103,780
Corrected Sample Mass	mn	mg	0.1083	0.0102	0.0941	0.0709
Grain Loading, Actual	cg	gr / dscf	0.0606	0.0045	0.0710	0.0454
		mg / dscm	138.60	10.29	162.45	103.78
		ppmv(wet)	1.092	*0.041*	1.332	0.822
		ppmv(dry)	97.8	*7.3*	114.7	73.3
METHYL MERCAPTAN		ug/m3	3,400,000	2,900,000	3,100,000	3,133,333
		dscm	0.0054	0.0056	0.0052	0.0054
Total		ug	18,406.64	16,374.66	16,212.98	16,998.09
CORRECTED CONCENTRATION		ug/m3	23,561,456	16,582,125	27,977,724	22,707,102
Corrected Sample Mass	mn	mg	18.4066	16.3747	16.2130	16.9981
Grain Loading, Actual	cg	gr / dscf	10.2962	7.2463	12.2261	9.9229
		mg / dscm	23,561.42	16,582.10	27,977.68	22,707.06
		ppmv(wet)	131.6	46.9	162.5	113.6
		ppmv(dry)	11,780.7	8,291.0	13,988.8	11,353.5
DIMETHYL SULFIDE		ug/m3	24,000,000	21,000,000	21,000,000	22,000,000
		dscm	0.0054	0.0056	0.0052	0.0054
Total		ug	129,929	118,575	109,830	119,445
CORRECTED CONCENTRATION		ug/m3	166,316,160	120,077,456	189,526,518	158,640,045
Corrected Sample Mass	mn	mg	129.93	118.58	109.83	119.44
Grain Loading, Actual	cg	gr / dscf	72.68	52.47	82.82	69.32
		mg / dscm	166,316	120,077	189,526	158,640
		ppmv(wet)	719.1	262.8	852.2	611.4
		ppmv(dry)	64,392.9	46,490.6	73,379.3	61,420.9
DIMETHYL DISULFIDE		ug/m3	310,000	430,000	260,000	333,333
		dscm	0.0054	0.0056	0.0052	0.0054
Total		ug	1,678	2,428	1,360	1,822
CORRECTED CONCENTRATION		ug/m3	2,148,250	2,458,729	2,346,519	2,317,833
Corrected Sample Mass	mn	mg	1.6783	2.4280	1.3598	1.8220
Grain Loading, Actual	cg	gr / dscf	0.9388	1.0745	1.0254	1.0129
		mg / dscm	2,148.25	2,458.72	2,346.51	2,317.83
		ppmv(wet)	6.1	3.5	7.0	5.5
		ppmv(dry)	548.6	627.9	599.2	591.9

Results in italics were below the laboratory detection limit and are reported as "less than results".

Flow Rate and Methanol Results

Client	Clearwater Paper Corp.				4/10/14	Date
Source	M & D Digesters 2 - pt1B				KRK	Operator
Location	Lewiston, ID				MEW	Analyist/QA
Definitions	Symbol		1	2	3	
			7:40	9:23	10:56	
			8:46	10:43	11:56	
Dry Air supply		lpm	0.50	0.50	0.50	0.50
		L	30.00	30.00	30.00	30.00
		Tdas	67.8	80.1	83.2	77.0
		dsl	**29.69**	**29.01**	**28.85**	**29.18**
Dry gas meter		Liters	60.070	60.547	60.171	60.263
Volume, Gas sample	Vm	dcf	2.121	2.138	2.125	2.128
Temperature, Dry gas meter	Tm	°F	73.75	84.75	88.67	82.39
Temperature, Stack gas	Ts	°F	212.0	212.0	213.0	
Temperature, Stack Dry Bulb	Tdb	°F	212.3	212.6	213.0	212.6
Temperature, Stack Wet Bulb	Twb	°F	211.3	211.6	212.0	211.6
Average square root velocity pressure	dp^½	in H2O^½	0.592	0.585	0.474	0.551
Pitot tube coefficient	Cp		0.8258	0.8258	0.8258	0.8258
Dry gas meter calibration factor	Y		0.98847	0.98847	0.98847	0.98847
Pressure, Barometric	Pbar	in Hg	29.60	29.60	29.60	29.60
Pressure, Static Stack	Pg	in H2O	-0.2015	-0.164	-0.0108	-0.1254
Time, Total sample	Ø	min	60	60	60	60
Stack Area	As	in²	56.7	56.7	56.7	56.7
Volume of condensed water	Vlc	ml	1,629	1,289	1,454	1457.6
Oxygen		% O2	20.95	20.95	20.95	20.95
Carbon Dioxide		% CO2	0.03	0.03	0.03	0.03
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96
Pressure, Absolute Stack	Ps	in Hg	29.59	29.59	29.60	29.59
Pressure, avg arcoss orifice	Po	in Hg	29.60	29.60	29.60	29.60
Volume, Dry standard gas sample	Vm(std)	dscf	2.05	2.03	2.00	2.03
Volume, Dry standard gas sample		dsl	**58.11**	**57.38**	**56.62**	**57.37**
Volume, Dry standard gas sample		dsl/min	0.97	0.96	0.94	0.96
Volume, Water Vapor	Vw(std)	scf	76.68	60.69	68.45	68.61
Volume, Water Vapor		sl	2,171.4	1,718.6	1,938.4	1,942.8
Volume, Water Vapor		sl/min	1.33	1.33	1.33	1.33
Moisture, % Stack (EPA 4)	Bws(1)	%	97.39	96.77	97.16	97.11
Moisture, % Stack (Psychrometry-Sat)	Bws(2)	%	101.13	101.12	103.11	101.79
Moisture, % Stack (Psychrometry)	Bws(4)	%	99.64	100.27	101.09	100.33
Moisture, % Stack (CALCULATED)	Bws(5)	%	98.71	98.38	98.59	98.56
Mole Fraction dry Gas	mfg		1.29%	1.62%	1.41%	1.44%
Molecular weight, Wet Stack	Ms	lbm / lbmole	18.16	18.19	18.17	18.17
Velocity, Stack gas	vs	fpm	2,805	2,770	2,246	2,607
Volumetric Flowrate, Actual	Qa	acf/min	1105.3	1091.4	884.9	1027.2
Volumetric Flowrate, Dry Standard	Qsw	wscf/min	858.6	847.9	686.7	797.7
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	11.09	13.77	9.70	11.52
Volumetric Stack Sample		dsl	**28.41**	**28.37**	**27.77**	
		dscf	1.00	1.00	0.98	
Volumetric Stack Sample Dilution			2.04	2.02	2.04	

METHANOL

Impinger		**ug**	30,000	25,000	30,000	28,333
Silica Gel Tube Front		**ug**	730	1,400	1,800	1,310
Silica Gel Tube Back		**ug**	610	940	1,300	950
Total		**ug**	31,340	27,340	33,100	30,593
TOTAL SAMPLE VOLUME		**ml**	1,699	1,359	1,544	1,534
ALIQUET		**ml**	43.18	42.07	42.27	42.51
Dilution Factor			39.35	32.29	36.53	36.06
Corrected Sample Mass	mn	mg	1,233	883	1,209	1,108.4
Grain Loading, Actual	cg	gr / dscf	18.964	13.599	19.027	17.197
		mg / dscm	43,396	31,119	43,542	39,352
		ppmv(wet)	421	379	462	421
		ppmv(dry)	32,581	23,364	32,690	29,545
	Ct	lbm / hr	1.8027	1.6050	1.5820	1.6632
		gm / hr	817.7	728.0	717.6	754.4
		ODTP/DAY	**215.6**	**216.2**	**215.5**	**215.8**
Production Pulp		ODT/hr	8.98	9.01	8.98	8.99
		lbm-MeOH/ODTP	0.2007	0.1782	0.1762	0.1850

md_2_pt_1B.xls

Flow Rate and TRS Results

Client	Clearwater Paper Corp.				4/10/14	Date
Source	M & D Digesters 2 - pt1B				JH	Operator
Location	Lewiston, ID				MEW	Analyist/QA
Definitions	Symbol					
			12:46	13:53	15:00	
			13:46	14:53	16:00	
Summa Can Id.			ssc00212	ssc00014	ssc00153	
Summa Can Initial Pressure		psig	-14.30	-14.30	-14.30	
Summa Can Final Pressure		psig	-1.61	-1.66	-1.55	
Difference			12.69	12.64	12.75	
Percent Volume			0.86	0.86	0.87	
Sample Volume		L	**5.18**	**5.16**	**5.21**	
Dry Air supply		lpm	0.08	0.08	0.08	0.08
		L	4.80	4.80	4.80	4.80
		Tdas	96.0	99.4	102.4	99.3
		dsl	**4.51**	**4.48**	**4.46**	**4.48**
Temperature, Stack gas	Ts	°F	213.0	213.0	213.0	213.0
Temperature, Stack Dry Bulb	Tdb	°F	213.0	213.0	213.0	213.0
Temperature, Stack Wet Bulb	Twb	°F	212.0	212.0	211.0	211.7
Average square root velocity pressure	dp^½	in H2O^½	0.693	0.570	0.575	0.613
Pitot tube coefficient	Cp		0.8258	0.8258	0.8258	0.8258
Pressure, Barometric	Pbar	in Hg	29.60	29.60	29.60	29.60
Pressure, Static Stack	Pg	in H2O	-0.1029	-0.1236	-0.1647	-0.1304
Time, Total sample	Ø	min	60	60	60	60
Stack Area	As	in²	56.7	56.7	56.7	56.7
Volume of condensed water	Vlc	ml	63.5	79.0	78.0	73.5
Oxygen		% O2	20.95	20.95	20.95	20.95
Carbon Dioxide		% CO2	0.03	0.03	0.03	0.03
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96
Pressure, Absolute Stack	Ps	in Hg	29.59	29.59	29.59	29.59
Pressure, avg arcoss orifice	Po	in Hg	29.60	29.60	29.60	29.60
Volume, Dry standard gas sample	Vm(std)	dscf	0.18	0.18	0.18	0.18
Volume, Dry standard gas sample (LAB)		dsl	**5.18**	**5.16**	**5.21**	**5.18**
Volume, Dry standard gas sample		dsl/min	0.09	0.09	0.09	0.09
Volume, Water Vapor	Vw(std)	scf	2.99	3.72	3.67	3.46
Volume, Water Vapor		sl	84.6	105.3	104.0	98.0
Volume, Water Vapor		sl/min	1.33	1.33	1.33	1.33
Moisture, % Stack (EPA 4)	Bws(1)	%	94.23	95.33	95.23	94.93
Moisture, % Stack (Psychrometry-Sat)	Bws(2)	%	103.13	103.14	103.15	103.14
Moisture, % Stack (Psychrometry)	Bws(4)	%	101.11	101.11	99.13	100.45
Moisture, % Stack (CALCULATED)	Bws(5)	%	99.21	99.36	99.29	99.29
Mole Fraction dry Gas	mfg		0.79%	0.64%	0.71%	0.71%
Molecular weight, Wet Stack	Ms	lbm / lbmole	18.10	18.09	18.09	18.09
Velocity, Stack gas	vs	fpm	3,291	2,708	2,729	2,909
Volumetric Flowrate, Actual	Qa	acf/min	1297.0	1067.3	1075.3	1146.5
Volumetric Flowrate, Dry Standard	Qsw	wscf/min	1006.2	828.0	834.1	889.4
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	7.92	5.31	5.96	6.40
Volumetric Stack Sample		dsl	**0.67**	**0.68**	**0.75**	**0.70**
		dscm	0.000672	0.000679	0.000748	0.000700
		dscf	0.0237	0.0240	0.0264	0.0247
Volumetric Stack Sample Dilution			7.71	7.60	6.96	7.42

md_2_pt_1B.xls

Clearwater Paper Corp.
M & D Digesters 2 - pt1B

4/10/2014
KRK
MEW

HYDROGEN SULFIDE		ug/m3	400	2,000	*290*	897
		dscm	0.0052	0.0052	0.0052	0.0052
Total		ug	2.07	10.32	1.51	4.63
CORRECTED CONCENTRATION		ug/m3	3,085	15,199	2,019	6,768
Corrected Sample Mass	mn	mg	0.0021	0.0103	0.0015	0.0046
Grain Loading, Actual	cg	gr / dscf	0.0013	0.0066	0.0009	0.0030
		mg / dscm	3.08	15.20	2.02	6.77
		ppmv(wet)	0.017	0.069	0.010	0.032
		ppmv(dry)	2.18	10.73	1.42	4.78
METHYL MERCAPTAN		ug/m3	1,200,000	2,700,000	2,300,000	2,066,667
		dscm	0.0052	0.0052	0.0052	0.0052
Total		ug	6,217.20	13,933.59	11,972.65	10,707.81
CORRECTED CONCENTRATION		ug/m3	9,254,381	20,519,241	16,008,809	15,260,810
Corrected Sample Mass	mn	mg	6.2172	13.9336	11.9726	10.7078
Grain Loading, Actual	cg	gr / dscf	4.0441	8.9668	6.9958	6.6689
		mg / dscm	9,254.37	20,519.21	16,008.78	15,260.79
		ppmv(wet)	36.4	65.7	57.2	53.1
		ppmv(dry)	4,627.2	10,259.6	8,004.4	7,630.4
DIMETHYL SULFIDE		ug/m3	110,000	750,000	210,000	356,667
		dscm	0.0052	0.0052	0.0052	0.0052
Total		ug	570	3,870	1,093	1,845
CORRECTED CONCENTRATION		ug/m3	848,318	5,699,789	1,461,674	2,669,927
Corrected Sample Mass	mn	mg	0.57	3.87	1.09	1.84
Grain Loading, Actual	cg	gr / dscf	0.37	2.49	0.64	1.17
		mg / dscm	848	5,700	1,462	2,670
		ppmv(wet)	2.59	14.14	4.04	6.92
		ppmv(dry)	328.4	2,206.8	565.9	1,033.7
DIMETHYL DISULFIDE		ug/m3	200,000	480,000	480,000	386,667
		dscm	0.0052	0.0052	0.0052	0.0052
Total		ug	1,036	2,477	2,499	2,004
CORRECTED CONCENTRATION		ug/m3	1,542,397	3,647,865	3,340,969	2,843,744
Corrected Sample Mass	mn	mg	1.0362	2.4771	2.4986	2.0040
Grain Loading, Actual	cg	gr / dscf	0.6740	1.5941	1.4600	1.2427
		mg / dscm	1,542.39	3,647.86	3,340.96	2,843.74
		ppmv(wet)	3.10	5.97	6.09	5.05
		ppmv(dry)	393.9	931.5	853.2	726.2

Flow Rate and Methanol Results

Client	Clearwater Paper Corp.				4/11-12/2014	Date
Source	M & D Digesters 2 - pt2B				KRK	Operator
Location	Lewiston, ID				MEW	Analyist/QA
Definitions	Symbol		1	2	3	
			7:45	7:00	8:14	
			8:45	8:00	9:14	
Dry Air supply		lpm	0.50	0.50	0.50	0.50
		L	30.00	30.00	30.00	30.00
		Tdas	77.3	91.5	86.1	85.0
		dsl	**29.16**	**28.41**	**28.69**	**28.76**
Dry gas meter		Liters	60.060	60.303	60.326	60.230
Volume, Gas sample	Vm	dcf	2.121	2.130	2.130	2.127
Temperature, Dry gas meter	Tm	°F	83.50	97.42	92.08	91.00
Temperature, Stack gas	Ts	°F	212.0	212.0	212.0	
Temperature, Stack Dry Bulb	Tdb	°F	212.0	212.3	212.0	212.1
Temperature, Stack Wet Bulb	Twb	°F	210.0	210.8	210.0	210.3
Average square root velocity pressure	dp^½	in H2O^½	0.526	0.555	0.461	0.514
Pitot tube coefficient	Cp		0.8258	0.8258	0.8258	0.8258
Dry gas meter calibration factor	Y		0.98847	0.98847	0.98847	0.98847
Pressure, Barometric	Pbar	in Hg	29.60	29.60	29.60	29.60
Pressure, Static Stack	Pg	in H2O	-0.1586	-0.2014	-0.1436	-0.1679
Time, Total sample	Ø	min	60	60	60	60
Stack Area	As	in²	56.7	56.7	56.7	56.7
Volume of condensed water	Vlc	ml	1,555	1,980	2,014	1849.7
Oxygen		% O2	20.95	20.95	20.95	20.95
Carbon Dioxide		% CO2	0.03	0.03	0.03	0.03
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96
Pressure, Absolute Stack	Ps	in Hg	29.59	29.59	29.59	29.59
Pressure, avg arcoss orifice	Po	in Hg	29.60	29.60	29.60	29.60
Volume, Dry standard gas sample	Vm(std)	dscf	2.01	1.97	1.99	1.99
Volume, Dry standard gas sample		dsl	**57.05**	**55.85**	**56.42**	**56.44**
Volume, Dry standard gas sample		dsl/min	0.95	0.93	0.94	0.94
Volume, Water Vapor	Vw(std)	scf	**73.21**	**93.19**	**94.81**	87.07
Volume, Water Vapor		sl	2,073.0	2,638.8	2,684.6	2,465.5
Volume, Water Vapor		sl/min	1.33	1.33	1.33	1.33
Moisture, % Stack (EPA 4)	Bws(1)	%	97.32	97.93	97.94	97.73
Moisture, % Stack (Psychrometry-Sat)	Bws(2)	%	101.12	101.13	101.12	101.12
Moisture, % Stack (Psychrometry)	Bws(4)	%	97.17	98.65	97.17	97.66
Moisture, % Stack (CALCULATED)	Bws(5)	%	98.67	98.97	98.98	98.87
Mole Fraction dry Gas	mfg		1.33%	1.03%	1.02%	1.13%
Molecular weight, Wet Stack	Ms	lbm / lbmole	18.16	18.13	18.13	18.14
Velocity, Stack gas	vs	fpm	2,492	2,629	2,184	2,435
Volumetric Flowrate, Actual	Qa	acf/min	981.9	1035.9	860.6	959.5
Volumetric Flowrate, Dry Standard	Qsw	wscf/min	762.8	804.7	668.6	745.4
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	10.13	8.28	6.83	8.41
Volumetric Stack Sample		dsl	**27.89**	**27.44**	**27.72**	
		dscf	0.98	0.97	0.98	
Volumetric Stack Sample Dilution			2.05	2.04	2.04	

METHANOL						
Impinger		**ug**	25,000	34,000	35,000	31,333
Silica Gel Tube Front		**ug**	2,100	1,100	1,700	1,633
Silica Gel Tube Back		**ug**	1,500	790	1,300	1,197
Total		**ug**	28,600	35,890	38,000	34,163
TOTAL SAMPLE VOLUME		**ml**	1,624	2,060	2,105	1,929
ALIQUET		**ml**	41.67	42.48	43.18	42.44
Dilution Factor			38.97	48.49	48.75	45.40
Corrected Sample Mass	mn	mg	1,115	1,740	1,852	1,569.0
Grain Loading, Actual	cg	gr / dscf	17.461	27.713	29.201	24.792
		mg / dscm	39,958	63,417	66,823	56,733
		ppmv(wet)	398	490	513	467
		ppmv(dry)	30,000	47,612	50,169	42,594
	Ct	lbm / hr	1.5158	1.9672	1.7104	1.7311
		gm / hr	687.6	892.3	775.8	785.2
		ODTP/DAY	**215.2**	**211.8**	**212.6**	**213.2**
Production Pulp		ODT/hr	9.0	8.8	8.9	8.9
		lbm-MeOH/ODTP	0.1690	0.2229	0.1931	0.1950

md_2_pt_2B.xls

Flow Rate and TRS Results

Client	Clearwater Paper Corp.				4/11-12/2014 Date	
Source	M & D Digesters 2 - pt2B				JH Operator	
Location	Lewiston, ID				MEW Analyist/QA	
Definitions	Symbol					
			9:24	10:31	11:35	
			10:24	11:31	12:35	
Summa Can Id.			ssc00162	ssc00118	ssc00088	
Summa Can Initial Pressure		psig	-14.30	-14.30	-14.30	
Summa Can Final Pressure		psig	-1.76	-1.81	-1.34	
Difference			12.54	12.49	12.96	
Percent Volume			0.85	0.85	0.88	
Sample Volume		L	**5.12**	**5.10**	**5.29**	
Dry Air supply		lpm	0.08	0.08	0.08	0.08
		L	4.80	4.80	4.80	4.80
		Tdas	88.1	87.7	70.9	82.2
		dsl	**4.57**	**4.58**	**4.72**	**4.62**
Temperature, Stack gas	Ts	°F	212.0	212.0	212.0	212.0
Temperature, Stack Dry Bulb	Tdb	°F	212.0	212.0	212.0	212.0
Temperature, Stack Wet Bulb	Twb	°F	210.8	211.0	211.0	210.9
Average square root velocity pressure	dp^½	in H2O^½	0.490	0.497	0.511	0.500
Pitot tube coefficient	Cp		0.8258	0.8258	0.8258	0.8258
Pressure, Barometric	Pbar	in Hg	29.60	29.60	29.60	29.60
Pressure, Static Stack	Pg	in H2O	-0.1892	-0.0941	-0.0276	-0.1036
Time, Total sample	Ø	min	60	60	60	60
Stack Area	As	in²	56.7	56.7	56.7	56.7
Volume of condensed water	Vlc	ml	75.5	68.0	135.9	93.1
Oxygen		% O2	20.95	20.95	20.95	20.95
Carbon Dioxide		% CO2	0.03	0.03	0.03	0.03
Molecular weight, Dry Stack	Md	lbm / lbmole	28.96	28.96	28.96	28.96
Pressure, Absolute Stack	Ps	in Hg	29.59	29.59	29.60	29.59
Pressure, avg arcoss orifice	Po	in Hg	29.60	29.60	29.60	29.60
Volume, Dry standard gas sample	Vm(std)	dscf	0.18	0.18	0.19	0.18
Volume, Dry standard gas sample (LAB)		dsl	**5.12**	**5.10**	**5.29**	**5.17**
Volume, Dry standard gas sample		dsl/min	0.09	0.08	0.09	0.09
Volume, Water Vapor	Vw(std)	scf	3.55	3.20	6.40	4.38
Volume, Water Vapor		sl	100.6	90.6	181.1	124.1
Volume, Water Vapor		sl/min	1.33	1.33	1.33	1.33
Moisture, % Stack (EPA 4)	Bws(1)	%	95.16	94.67	97.16	95.66
Moisture, % Stack (Psychrometry-Sat)	Bws(2)	%	101.13	101.11	101.09	101.11
Moisture, % Stack (Psychrometry)	Bws(4)	%	98.65	99.12	99.10	98.95
Moisture, % Stack (CALCULATED)	Bws(5)	%	99.46	99.43	99.69	99.53
Mole Fraction dry Gas	mfg		0.54%	0.57%	0.31%	0.47%
Molecular weight, Wet Stack	Ms	lbm / lbmole	18.07	18.08	18.05	18.07
Velocity, Stack gas	vs	fpm	2,325	2,361	2,429	2,372
Volumetric Flowrate, Actual	Qa	acf/min	916.2	930.3	957.3	934.6
Volumetric Flowrate, Dry Standard	Qsw	wscf/min	711.7	722.9	744.0	726.2
Volumetric Flowrate, Dry Standard	Qsd	dscf/min	3.84	4.14	2.33	3.43
Volumetric Stack Sample		dsl	**0.55**	**0.52**	**0.57**	**0.55**
		dscm	0.000546	0.000522	0.000568	0.000545
		dscf	0.0193	0.0184	0.0201	0.0193
Volumetric Stack Sample Dilution			9.38	9.78	9.31	9.49

md_2_pt_2B.xls

Clearwater Paper Corp.
M & D Digesters 2 - pt2B

4/11-12/2014
KRK
MEW

HYDROGEN SULFIDE		ug/m3	11,000	*300*	12,000	7,767
		dscm	0.0051	0.0051	0.0053	0.0052
Total		ug	56.32	1.53	63.49	40.45
CORRECTED CONCENTRATION		ug/m3	103,165	2,933	111,719	72,606
Corrected Sample Mass	mn	mg	0.0563	0.0015	0.0635	0.0404
Grain Loading, Actual	cg	gr / dscf	0.0451	0.0013	0.0488	0.0317
		mg / dscm	103.16	2.93	111.72	72.61
		ppmv(wet)	0.393	0.012	0.247	0.217
		ppmv(dry)	72.8	2.1	78.9	51.2
METHYL MERCAPTAN		ug/m3	2,500,000	1,700,000	4,100,000	2,766,667
		dscm	0.0051	0.0051	0.0053	0.0052
Total		ug	12,799.40	8,668.89	21,694.07	14,387.45
CORRECTED CONCENTRATION		ug/m3	23,446,575	16,622,883	38,170,572	26,080,010
Corrected Sample Mass	mn	mg	12.7994	8.6689	21.6941	14.3875
Grain Loading, Actual	cg	gr / dscf	10.2460	7.2641	16.6803	11.3968
		mg / dscm	23,446.54	16,622.86	38,170.51	26,079.97
		ppmv(wet)	63.3	47.5	59.7	56.8
		ppmv(dry)	11,723.3	8,311.4	19,085.3	13,040.0
DIMETHYL SULFIDE		ug/m3	440,000	280,000	480,000	400,000
		dscm	0.0051	0.0051	0.0053	0.0052
Total		ug	2,253	1,428	2,540	2,073
CORRECTED CONCENTRATION		ug/m3	4,126,597	2,737,887	4,468,750	3,777,745
Corrected Sample Mass	mn	mg	2.25	1.43	2.54	2.07
Grain Loading, Actual	cg	gr / dscf	1.80	1.20	1.95	1.65
		mg / dscm	4,127	2,738	4,469	3,778
		ppmv(wet)	8.6	6.1	5.4	6.7
		ppmv(dry)	1,597.7	1,060.0	1,730.2	1,462.6
DIMETHYL DISULFIDE		ug/m3	280,000	240,000	290,000	270,000
		dscm	0.0051	0.0051	0.0053	0.0052
Total		ug	1,434	1,224	1,534	1,397
CORRECTED CONCENTRATION		ug/m3	2,626,016	2,346,760	2,699,870	2,557,549
Corrected Sample Mass	mn	mg	1.4335	1.2238	1.5345	1.3973
Grain Loading, Actual	cg	gr / dscf	1.1476	1.0255	1.1798	1.1176
		mg / dscm	2,626.01	2,346.76	2,699.87	2,557.54
		ppmv(wet)	3.6	3.4	2.2	3.1
		ppmv(dry)	670.6	599.3	689.4	653.1

Results in italics were below the laboratory detection limit and are reported as less than results.

Clearwater Paper, M&D No1, PH1A
April 8, 2014 Example Calculations

METHANOL CALC

DRY AIR SUPPLY (RUN 1; MO#1-PH1A)

θ = 60 min

Q = 0.50 lpm

T_{DAS} = 86.8 °F

Pb = 29.6 inHg

$$V_{DAS} = \frac{(0.50 \cdot 60) \cdot 29.6}{(86.8 + 459.67)} \left(\frac{68 + 459.67}{29.92126} \right)$$

V_{DAS} = 28.657 L_{STD}

DRY GAS METER

V_m = 60.25 L

T_m = 85.79 °F

P_o = 29.60 inHg

$$V_{m(STD)} = 60.25 \left(\frac{29.6}{29.92126} \right) \left(\frac{527.67}{85.79 + 459.67} \right) (0.99140)$$

$V_{m(STD)}$ = 57.163 L_{STD}

SAMPLE VOLUME

$V_{m(STD)} - V_{DAS} = V_{SAMPLE}$

$57.163 - 28.657 = 28.506\ L_{STD}$

Volumetric STACK SAMPLE Dilution

$$\frac{57.163}{28.506} = 2.005$$

LIQUID SAMPLE DILUTION

IMP CONTENTS, CONDENSATE & RINSE

1159 gm

IMP = 100.3 gm

TOTAL LIQ SAMLPE = 1159 − 100.3

= 1058.7 gm

= 1060.58 ml

VOA VIAL & Sample = 64.1 g

VOA VIAL = 20.6 g

SAMPLE = 42.5 g

= 42.58 ml

3/5

LIQUID SAMPLE DILUTION

$$\frac{1060.5}{42.58} = 24.906$$

METHANOL

IMP + TUBE = 20,020 ug

CORRECTED

$$= 20{,}020\ \mu g \times 24.906 \times \frac{mg}{1000\ \mu g}$$

MeOH = 498.6 mg

EMISSIONS

$$c_g = \frac{15.432 \cdot MeOH}{V_{sample} \cdot 1000}$$

$$= \frac{15.432 \cdot 498.6}{\left(\frac{28.506\ L}{28.3168\ L/ft^3}\right) 1000}$$

C_g = 7.643 gr/dscf

$$C_g = 7.643 \frac{gr}{dscf} \cdot \frac{453.592\ gm}{7000\ gr} \cdot \frac{35.3147\ ft^3}{1\ m^3}$$

$$= 17.490\ gm/m^3$$

$$= 17490\ mg/m^3$$

$$PPMV = \frac{mg/m^3 \cdot 24.055 \left(\frac{m^3}{mg} \frac{lb}{lbmol}\right)}{mw\left(lb/lbmol\right)}$$

$$PPMV_{(DRY)} = \frac{17490 \cdot 24.055}{32.04}$$

$$PPMV_{(DRY)} = 13,131$$

$$C_{g_{WET}} = 7.643 \frac{gr}{dscf} \cdot \frac{19.76\ dscf/min}{853.2\ wscf/min}$$

$$C_{g_{WET}} = 0.177 \frac{gr}{wscf}$$

$$PPMV_{(WET)} = 13131 \left(\frac{0.177}{7.643}\right) =$$

$$PPMV_{(WET)} = 304$$

$$C_t = \left(\frac{60}{7000}\right) 7.695 \left(\frac{gr}{dscf}\right) \cdot 19.76 \, dscf/min$$

$C_t = 1.295$ lbm/hr MeOH

CALCULATED MOISTURE

$V_{w(STD)} = 42.47$ scf

$V_{m(STD} = 1.01$ dscf (THIS IS ACTUAL STACK SAMPLE)

$$BWS = 100\left(\frac{1.01}{42.47 + 1.01}\right) = 2.32$$

$$mfg = 1 - \frac{2.32}{100} = 97.68\%$$

1/2

Clearwater Paper, M&D No1, sample Pt 1A, Run 1
April 8, 2014
TRS CALC

SUMMA CAN VOLUME

INITIAL Pressure −14.6 psig

FINAL − 1.65 psig

TOTAL −1.65 − (−14.6)

= 12.65 psig

$$\left(\frac{12.65}{14.696}\right)(6\ \mathcal{L}) = 5.165\ \mathcal{L}$$

DRY AIR SUPPLY

Θ = 60 min

Q = 0.08 lpm

T_{DAS} = 98 °F

Pb = 29.6 inHg

$$V_{DAS} = \frac{(0.08 \cdot 60) \cdot 29.6}{(98 + 459.67)}\left(\frac{527.67}{29.92126}\right)$$

$$V_{IDAS} = 4.493\ \mathcal{L}_{STD}$$

SAMPLE VOLUME

$5.165 - 4.493 = 0.672\ \mathcal{L}_{STD}$

$$\text{DILUTION} = \frac{5.165}{0.672} = 7.686$$

Clearwater Paper

DIMETHYL SULFIDE

CONC. = 12,000,000 ug/m³

SUMMA CAN VOLUME = 5.165 L

= 0.005165 dscm

SAMPLE MASS = 12,000,000 $\frac{ug}{m^3}$ × 0.005165 m³

= 61,980 ug (DMS)

CORRECT CONC.

STACK SAMPLE VOLUME = 0.672 L_{STD}

= 0.000672 m³

CONC. = $\frac{61980\ ug}{0.000672\ m^3}$

= 92,232,143 ug/m³ (DMS)

$PPMV_{(DRY)} = \frac{92,232,143\ ug/m^3 \cdot 24.055}{1000 \cdot 62.13\ lb/lbmol}$

$PPMV_{(DRY)} = 35,709$

$PPMV_{(WET)} = 35,709 \left(\frac{12.81\ dscf/min}{854.1\ wscf/min} \right) = 536$

Sample Calculations – EPA Method 1-4 Flow Rate

1/2

Client: Clearwater Paper Date 4/10/2014

Source MD2 / 1B Project # 5110 Run # 2

YM 308

Molecular Weights (lb/lbmol):

CO_2=44.0	O_2=32.0	N_2+Ar=28.0	H_2O=18.0	atm=29.0

Constants:

Pstd(1)=29.92129 in Hg	Tstd=527.67 °R	Kp=5129.4	C2=816.5455inHg $in^2/°R\ ft^2$

Pressure, Absolute Stack (Ps):

$$Ps, inHg = P_{Barometric} + \frac{P_{static}}{13.6} = \underline{29.6}\ inHg + \frac{\underline{-0.164}\ in\ H2O}{13.6} = \underline{29.59}\ inHg$$

Volume, Dry Standard Gas Sample (Vm[std]): $Tm = \underline{84.8}\ ^\circ F + 459.7 = \underline{544.5}\ ^\circ R$

$$Orifice\ Pressure = Pb\ \underline{29.6}\ inHg + \frac{\underline{\quad}\ \Delta H}{13.6} = \underline{29.6}\ inHg$$

60.597 l X cf / 28.32 l

$$Vm(std)\ ft^3 = \frac{Y \times MeterVol \times Tstd \times Orifice\ Pres(Po)}{Pstd(1) \times Tm \circ R}$$

$$= \frac{\underline{0.98847} \times \underline{2.138}\ ft^3 \times 528 \circ R \times (Po\ \underline{29.6}\ inHg)}{29.92 inHg \times \underline{544.5} \circ R} = \underline{2.02}\ dscf$$

use vol. corr for dilution = 1.00

Moisture, % Stack Gas (bws): $V_{wstd} = 0.04706 \times Cond.H2O, ml = 0.04706 \times \underline{289}\ ml = \underline{60.66}\ scf$ (YM 308)

$$bws = 100 \times \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = \frac{\underline{60.66}\ scf}{\underline{60.66}\ scf + \underline{1.00}\ dscf} = \underline{98.38}\ \%$$

[use instead of WB/DB]

Mole Fraction Gas (mfg):

$$1 - \frac{bws}{100} = 1 - \frac{\underline{98.38}\ \%}{100} = \underline{0.0162}$$

Molecular Weight, Dry, Stack (Md):

$$Md\ \frac{lb}{lbmol} = \left[(1 - \frac{O_2}{100} - \frac{CO_2}{100}) \times MolWtN2Ar\right] + \left[\frac{O_2}{100} \times MolWtO2\right] + \left[\frac{CO_2}{100} \times MolWtCO2\right]$$

$$= \left[(1 - \frac{\underline{\quad}\ \%O_2}{100} - \frac{\underline{\quad}\ \%CO_2}{100}) \times 28.0\ \frac{lb}{lbmol}\right] + \left[\frac{\underline{\quad}\ \%O_2}{100} \times 32.0\ \frac{lb}{lbmol}\right] +$$

$$\left[\frac{\underline{\quad}\ \%CO_2}{100} \times 44.0\ \frac{lb}{lbmol}\right]$$

$$= \underline{\quad}\ \frac{lb}{lbmol}$$

28.96 @ ambient cond.

Sample Calculations – EPA Method 1-4 Flow Rate

Client: Clearwater Paper Date 4/10/14

M5D 2 1B Run 2

Molecular Weight, Wet, Stack (Ms):

$$Ms\frac{lb}{lbmol} = (Md \times mfg) + (MolWtH_2O \times (1 - mfg)) = \left(\underline{28.96}\ \frac{lb}{lbmol} \times \underline{.0162}\right) + (18.0 \times (1 - \underline{.9838}))$$

$$= \underline{18.18}\ \frac{lb}{lbmol}$$

Stack gas (vs): $Ts = \underline{212}\ ^\circ F + 459.7 = \underline{671.7}\ ^\circ R$

$$= vs\frac{feet}{\min} = Kp \times Cp \times dp\sqrt{inH_2O} \times \sqrt{\frac{Ts \circ R}{Ps \times Ms}}$$

$$= 5129.4\ ft/\min \ldots \times \underline{.8258} \times \underline{.585}\ dp\sqrt{inH_2O} \times \sqrt{\frac{\underline{671.7}\ ^\circ R}{\underline{29.59}\ inHg \times \underline{18.18}\ \frac{lb}{lbmol}}} = \underline{2769.0}\ \frac{ft}{\min}$$

Flow Rate, Actual (Qa): 8.5" ϕ

$$Qa\frac{actualCubicFeet}{\min} = \frac{AreaStack \times vs}{144} = \frac{\underline{56.75}\ in^2 \times \underline{2769}\ \frac{ft}{\min}}{144} = \underline{1091.2}\ acfm$$

Flow Rate, Dry Standard (Qsd):

$$Qsd\frac{dryStdFt^3}{\min} = \frac{Qa \times Tstd \times mfg \times Ps}{Pstd(1) \times Ts \circ R} = \frac{\underline{1091.2}\ acfm \times 528 \circ R \times \underline{.0162} \times \underline{29.59}\ inHg}{29.92 inHg \times \underline{671.7}\ ^\circ R}$$

$$= \underline{13.74}\ \frac{dscf}{\min}$$

Sample Calculations – EPA Method 1-4 Flow Rate

1/2

Client: Clearwater Paper Date 4/8/14

Source M3 D1, 1A Project # 5110 M16A Run # 1

Molecular Weights (lb/lbmol):

CO_2=44.0	O_2=32.0	N_2+Ar=28.0	H_2O=18.0	atm=29.0

Constants:

Pstd(1)=29.92129 in Hg	Tstd=527.67 °R	Kp=5129.4	C2=816.5455inHg $in^2/°R\ ft^2$

Pressure, Absolute Stack (Ps):

$$Ps, inHg = P_{Barometric} + \frac{P_{static}}{13.6} = \underline{29.6}\ inHg + \frac{\underline{-0.1008}\ in\ H2O}{13.6} = \underline{29.59}\ inHg$$

Volume, Dry Standard Gas Sample (Vm[std]): $Tm = \_\_\_\_\_ ^\circ F + 459.7 = \_\_\_\_\_ ^\circ R$

$$Orifice\ Pr ess = Pb\ \_\_\_\_\_\ inHg + \frac{\_\_\_\_\_\ \Delta H}{13.6} = \_\_\_\_\_\ inHg$$

$$Vm(std)\ ft^3 = \frac{Y \times MeterVol \times Tstd \times Orifice\ Pr es(Po)}{Pstd(1) \times Tm \circ R}$$

$$= \frac{\_\_\_\_\_ \times \_\_\_\_\_\ ft^3 \times 528 \circ R \times (Po\ \_\_\_\_\_\ inHg)}{29.92 inHg \times \_\_\_\_\_ \circ R} = \_\_\_\_\_\ dscf$$

NA use Vol corrected for dilution 0.0237 dscf (sample recovery field data)

Moisture, % Stack Gas (bws): $V_{wstd} = 0.04706 \times Cond.H2O, ml = 0.04706 \times \underline{33.1}\ ml = \underline{1.56}\ scf$

$$bws = 100 \times \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = \frac{\underline{1.56}\ scf}{\underline{1.56}\ scf + \underline{0.0237}\ dscf} = \underline{98.5}\ \%$$

Mole Fraction Gas (mfg):

$$1 - \frac{bws}{100} = 1 - \frac{\underline{98.5}\ \%}{100} = \underline{0.0150}$$

Molecular Weight, Dry, Stack (Md):

$$Md\ \frac{lb}{lbmol} = \left[(1 - \frac{O_2}{100} - \frac{CO_2}{100}) \times MolWtN2Ar\right] + \left[\frac{O_2}{100} \times MolWtO2\right] + \left[\frac{CO_2}{100} \times MolWtCO2\right]$$

$$= \left[(1 - \frac{\_\_\_\_\_\ \%O_2}{100} - \frac{\_\_\_\_\_\ \%CO_2}{100}) \times 28.0\ \frac{lb}{lbmol}\right] + \left[\frac{\_\_\_\_\_\ \%O_2}{100} \times 32.0\ \frac{lb}{lbmol}\right] +$$

$$\left[\frac{\_\_\_\_\_\ \%CO_2}{100} \times 44.0\ \frac{lb}{lbmol}\right]$$

$$= \_\_\_\_\_\ \frac{lb}{lbmol}$$

at atmospheric cond. 28.96 lb/lbmol

Sample Calculations – EPA Method 1-4 Flow Rate

Client: Clearwater Paper Date 4/8/14

MDI PM1A R1

Molecular Weight, Wet, Stack (Ms):

$$Ms\frac{lb}{lbmol} = (Md \times mfg) + (MolWtH_2O \times (1 - mfg)) = \left(28.96\frac{lb}{lbmol} \times \underline{0.0150}\right) + (18.0 \times (1 - \underline{0.985}))$$

$$= \underline{18.16}\ \frac{lb}{lbmol}$$

Stack gas (vs): $Ts = \underline{212}\ ^\circ F + 459.7 = \underline{671.7}\ ^\circ R$

$$= vs\frac{feet}{\min} = Kp \times Cp \times dp\sqrt{inH_2O} \times \sqrt{\frac{Ts \circ R}{Ps \times Ms}}$$

$$= 5129.4\ ft/\min \ldots \times \underline{.8258} \times \underline{.538}\ dp\sqrt{inH_2O} \times \sqrt{\frac{\underline{671.7}\ ^\circ R}{\underline{29.59}\ inHg \times \underline{18.16}\ \frac{lb}{lbmol}}} = \underline{2548}\ \frac{ft}{\min}$$

Flow Rate, Actual (Qa): 0.5" ϕ

$$Qa\frac{actualCubicFeet}{\min} = \frac{AreaStack \times vs}{144} = \frac{\underline{56.75}\ in^2 \times \underline{2548}\ \frac{ft}{\min}}{144} = \underline{1004}\ acfm$$

Flow Rate, Dry Standard (Qsd):

$$Qsd\frac{dryStdFt^3}{\min} = \frac{Qa \times Tstd \times mfg \times Ps}{Pstd(1) \times Ts \circ R} = \frac{\underline{1004}\ acfm \times 528 \circ R \times \underline{.0150} \times \underline{29.59}\ inHg}{29.92 inHg \times \underline{671.7} \circ R}$$

$$= \underline{11.7}\ \frac{dscf}{\min}$$

Sample Calculations, Additional Concentrations and Rates - Gases

Client: Clearwater Paper Source M 1 & D 2, Pt 1B & 2B
Date 4/10-12/14 Project # 5110 Run # all Page _____
M 308

Gaseous Emissions Production Based: lb/ton

Gas Name: Methanol Measured Results, lb/hr Pt 1B: 1.66 lb/hr avg
Production Rate, ton/hr 8.935 t/h Pt 2B: 1.73 lb/hr avg

Equation: $lb/ton = lb/hr \div ton/hr$

Calculation: 3.39 $lb/hr \div$ 8.935 $ton/hr =$ 0.379 lb/ton

where: ton/hr = average Pt 1B & 2B

1B: $215.8\ \frac{ton}{day} \times \frac{day}{24\ hr} = 8.99\ \frac{ton}{hr}$

average = $8.935\ \frac{ton}{hr}$

2B: $213.2\ \frac{ton}{D} \div 24 = 8.88\ \frac{ton}{hr}$

and where lb/hr = sum 1B + 2B

1B = $1.66\ \frac{lb}{hr}$

2B = $1.73\ \frac{lb}{hr}$

— sum = $3.39\ \frac{lb}{hr}$

308

Method 26 Field Data Sheet

HORIZON ENGINEERING

Client: Clearwater Paper
Facility Location: Lewiston, ID
Source: M+D #1
Sample Location: 1A

Date 4-8-14
Test Method 308
Concurrent Testing —
Run # 1
Operator KRK Support TL/JH
Temperature, Amb (Ta) 78
Moisture — Tdb — Twb —
Press., Bar (Pb)
Press., Static (Pstat)

Stack Diagram
ALT-011
Std TC (ID/°F) —
Stack TC (ID/°F) —
Continuity Check ↑ or ↓

Probe Heat Set — °F
Filter Heat Set — °F
Meter Box ID LMB #1 Y .99140

System	Pretest: .00	Lpm	11	inHg
Leak Check	Post: .00	Lpm	12	inHg

No more than 0.04 Lpm @ ≥ 10 inHg

System	Pretest: —	cfm	—	inHg
Leak Check	Post: —	cfm	—	inHg

No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L — Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft — Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm 2 Lpm = 0.07 cfm	Ex.t Imp STACK °F (Ts)	PROBE °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)	MFC Temp °F
	807	9155.06			Amb:	Amb:	Amb:	Amb:	Amb:		
5		9160.08		1 Lpm	78			81	81	23	
10		9165.13			78			80	81	2	
15	820/840	9171.88			66			82	82	2	
20		9177.15			73			85	84	3	
25		9182.26			72			87	85	3	
30		9187.31			71			87	87	3	
35					71			87	87	3	87
40		9196.65			71			87	87	3	87
45		9201.70			71			88	88	3	87
50		9206.90			71			89	88	4	87
55		9212.15			71			89	88	4	87
60	927	9217.51			71			89	88	5	86
					~~71~~			~~89~~	~~89~~		

Notes:

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Paused @ 820 9167.62 Leak ✓ .00 @ 14 inHg
Resumed @ 840 new volume 9169.82 Leak ✓ .00 @ 15 inHg

308

Method 26 Field Data Sheet

HORIZON ENGINEERING

Client: Clearwater
Facility Location: Lewiston ID
Source: MFD #1
Sample Location: 1A

Date 4/8/14
Test Method 308
Concurrent Testing —
Run # 2
Operator KRC Support TL/JH
Temperature, Amb (Ta)
Moisture — Tdb — Twb —
Press., Bar (Pb)
Press., Static (Pstat)

Stack Diagram
ALT-011
Std TC (ID/°F) —
Stack TC (ID/°F) —
Continuity Check ↑ or ↓

Probe Heat Set — °F
Filter Heat Set — °F
Meter Box ID 1 Y .99140

System	Pretest: .00	Lpm 11	inHg
Leak Check	Post: .00	Lpm 20	inHg

No more than 0.04 Lpm @ ≥ 10 inHg

System	Pretest: —	cfm —	inHg
Leak Check	Post: —	cfm —	inHg

No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm 2 Lpm = 0.07 cfm	Ext. Temp ~~STACK~~ °F (Ts)	MFC Temp ~~PROBE~~ °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)
	958	9219.51			Amb:	Amb:	Amb:	Amb:	Amb:	
5		9224.62		1 Lpm	74	87		91	90	2
10		9229.65			74	88		91	91	3
15		9234.52			74	88		91	91	4
20		9239.53			74	88		91	91	4
25		9244.54			75	90		92	92	5
30		9249.58			75	90		92	92	7
35		9254.64			76	90		93	92	7
40		9259.50			76	90		93	92	8
45		9264.60			73	90		93	92	8
50		9269.62			72	90		92	92	10
55		9274.56			73	90		91	91	13
60	1058	9279.61		↓	74	91		92	91	17

Notes:

308

Method 26 Field Data Sheet

HORIZON ENGINEERING

Client: Clearwater
Facility Location: Lewiston ID
Source: M+D #1
Sample Location: 1A

Date 4/8/14
Test Method 308
Concurrent Testing —
Run # 3
Operator KRC Support TL/JH
Temperature, Amb (Ta) 90
Moisture — Tdb — Twb —
Press., Bar (Pb)
Press., Static (Pstat)

Stack Diagram
ALT-011
Std TC (ID/°F) —
Stack TC (ID/°F) —
Continuity Check ↑ or ↓

Probe Heat Set — °F
Filter Heat Set — °F
Meter Box ID LMB #1 Y .99140

System	Pretest: .00	Lpm 13	inHg
Leak Check	Post: .00	Lpm 25	inHg

No more than 0.04 Lpm @ ≥ 10 inHg

System	Pretest: —	cfm —	inHg
Leak Check	Post: —	cfm —	inHg

No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm 2 Lpm = 0.07 cfm	Ex t Imp ~~STACK~~ °F (Ts)	MFC Temp ~~PROBE~~ °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)
	1140	9287.27			Amb:	Amb:	Amb:	Amb:	Amb:	
5		9292.40		1 Lpm	74	91		94	94	11
10		9297.30			70	91		95	94	20
* 15	1155 / 1204	9301.83			68	92		95	94	20
20		9310.25			75	92		95	95	4
25		9314.99			72	93		96	95	13
30		9319.96			69	93		96	96	15
35		9324.32			68	94		97	96	20
*2 40	1225 / 1241	9328.35			68	94		98	97	23
45		9335.75			70	92		98	97	5
50	1251 / 1250	9340.50			71	92		98	97	10
55		9345.19			72	93		98	97	8
60	1302 / 1306	9348.42			73	93		98	97	20
63	1309	9352.03			73	93		98	98	10

Notes:

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* paused Leak ← .00 @ 18 inHg High vacuum
1155 Leak ← .00 @ 16 in Hg
Resumed @ 1204 new volume 9305.20

*2 = Pause #2
high vacuum
Leak ← .00 @ 24
Leak ← .00 @
new volume 9330.74

308

Method ~~26~~ Field Data Sheet

HORIZON ENGINEERING LLC

Client: Clearwater
Facility Location: Lewiston, ID
Source: M+D #1
Sample Location: 2A

Date 4/9/14
Test Method 308
Concurrent Testing —
Run # 1
Operator KRK Support JH/TL/JS
Temperature, Amb (Ta)
Moisture — Tdb — Twb —
Press., Bar (Pb) 30.3
Press., Static (Pstat)

Stack Diagram
ALT-011
Std TC (ID/°F) —
Stack TC (ID/°F) —
Continuity Check ↑ or ↓

Probe Heat Set — °F
Filter Heat Set — °F
Meter Box ID AMB #3 Y .98847

System	Pretest: .00	Lpm 13	inHg
Leak Check	Post: .00	Lpm 14	inHg

No more than 0.04 Lpm @ ≥ 10 inHg

System	Pretest: —	cfm —	inHg
Leak Check	Post: —	cfm —	inHg

No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm 2 Lpm = 0.07 cfm	~~Exit Temp STACK~~ °F (Ts)	~~MFC Temp PROBE~~ °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)
	845	0.000			Amb:	Amb:	Amb:	Amb:	Amb:	
5		4.91		1 Lpm	68	91		87	87	2
10		10.02			65	92		87	87	3
15		14.93			63	92		88	88	3
20		19.96			64	92		89	89	3
25		25.10			65	92		89	89	4
30		29.92			66	92		90	90	4
35		35.10			68	91		91	91	5
40		39.89			67	91		91	91	5
45		45.12			69	92		91	91	5
50		50.03			66	92		92	92	6
55		55.02			68	92		92	92	6
60	945	60.169		↓	69	92		92	92	7

Notes:

308

Method 26 Field Data Sheet

HORIZON ENGINEERING LLC

Client: Clearwater
Facility Location: Lewiston ID
Source: M+D 1
Sample Location: 2A

Date 4/9/14
Test Method 308
Concurrent Testing —
Run # 2
Operator RRK Support TL/SS
Temperature, Amb (Ta) 90
Moisture — Tdb — Twb —
Press., Bar (Pb) 30.3
Press., Static (Pstat)

Stack Diagram
ALT-011
Std TC (ID/°F) —
Stack TC (ID/°F) —
Continuity Check ↑ or ↓

Probe Heat Set — °F
Filter Heat Set — °F
Meter Box ID LMB 3 Y .98847

System	Pretest: .00	Lpm 12	inHg
Leak Check	Post: .00	Lpm 13	inHg

No more than 0.04 Lpm @ ≥ 10 inHg

System	Pretest: —	cfm —	inHg
Leak Check	Post: —	cfm —	inHg

No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L — Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft — Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm 2 Lpm = 0.07 cfm	~~Exit~~ Imp ~~STACK~~ °F (Ts)	MFC Temp PROBE °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)
	1008	00.000			Amb:	Amb:	Amb:	Amb:	Amb:	
5		4.92		1 Lpm	71	90		91	91	3
10		10.21			68	90		91	91	3
15		15.16			68	90		91	91	3
20		19.84			69	90		91	91	3
25		25.33			72	90		91	91	8
30		30.16			71	91		91	91	8
35		35.19			64	91		92	92	8
40		40.05			63	91		92	92	8
45		45.24			63	92		92	92	8
50		50.11			66	92		93	93	8
55		55.07			66	92		93	93	8
60	1108	60.061		↓	67	92		93	93	8
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Notes:

308

Method ~~26~~ Field Data Sheet

HORIZON ENGINEERING LLC

Client: Clearwater
Facility Location: Lewiston, ID
Source: M+D #1
Sample Location: 2A

Date 4/9/14
Test Method 308
Concurrent Testing —
Run # 3
Operator KRC Support TL/JS
Temperature, Amb (Ta) 89
Moisture — Tdb — Twb —
Press., Bar (Pb) 30.3
Press., Static (Pstat)

Stack Diagram
ALT-011
Std TC (ID/°F) —
Stack TC (ID/°F) —
Continuity Check ↑ or ↓

Probe Heat Set — °F
Filter Heat Set — °F
Meter Box ID LMB #3 Y .98847

System	Pretest: .00	Lpm 12	inHg
Leak Check	Post: .00	Lpm 12	inHg

No more than 0.04 Lpm @ ≥ 10 inHg

System	Pretest: —	cfm —	inHg
Leak Check	Post: —	cfm —	inHg

No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm 2 Lpm = 0.07 cfm	Exit Imp STACK °F (Ts)	MFC Temp PROBE °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)
	1226	00.000			Amb:	Amb:	Amb:	Amb:	Amb:	
5		4.89		1 Lpm	75	92		89	89	3
10		9.97			74	92		89	89	3
15		15.08			74	92		90	90	3
20		20.03			74	92		90	90	3
25		25.16			75	92		91	91	4
30		30.21			76	92		92	92	4
35		35.09			76	93		92	92	4
40		39.98			76	93		93	93	5
45		45.07			73	93		93	93	7
50		50.06			69	93		94	94	8
55		55.01			69	93		94	94	8
60	1326	60.225		↓	70	94		94	94	8

Notes:

308

Method ~~26~~ Field Data Sheet

HORIZON ENGINEERING LLC

Client: Clearwater
Facility Location: Lewiston, ID
Source: M+D #2
Sample Location: 1B

Date 4/10/14
Test Method 308
Concurrent Testing —
Run # 1
Operator KRK Support TL, JS, JH
Temperature, Amb (Ta) 68
Moisture — Tdb — Twb —
Press., Bar (Pb) 29.6
Press., Static (Pstat)

Stack Diagram
ALT-011
Std TC (ID/°F) —
Stack TC (ID/°F) —
Continuity Check ↑ or ↓

Probe Heat Set — °F
Filter — Heat Set — °F
Meter Box ID AMB 3 Y .98847

System	Pretest: .00	Lpm 12	inHg
Leak Check	Post: .00	Lpm 14	inHg

No more than 0.04 Lpm @ ≥ 10 inHg

System	Pretest: —	cfm —	inHg
Leak Check	Post: —	cfm —	inHg

No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L; Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft; Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm 2 Lpm = 0.07 cfm	Exit Imp ~~STACK~~ °F (Ts)	MFC Temp ~~PROBE~~ °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)
	740	00.000			Amb:	Amb:	Amb:	Amb:	Amb:	
5	~~741~~ 743	4.92		1 Lpm	63	69		72	72	2
10		10.01			63	66		72	72	5
15		14.87			62	67		73	73	7
20		20.15			62	66		73	73	8
25		25.23			62	66		73	73	9
30		30.02			63	68		73	73	10
35		35.19			65	69		73	73	10
40		40.06			66	69		74	74	10
45		44.92			66	69		75	75	10
50		50.24			65	69		75	75	11
55	~~840~~ 844	55.06			64	68		76	76	11
60	846	60.07		↓	63	67		76	76	11
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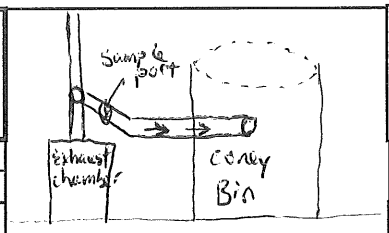
Notes: TL Standard for MFC temps

308

Method 26 Field Data Sheet

HORIZON ENGINEERING LLC

Date	4/10/14
Test Method	308
Concurrent Testing	—
Run #	2
Operator	RRC Support JH, TL, SS
Temperature, Amb (Ta)	
Moisture —	Tdb — Twb —
Press., Bar (Pb)	29.6
Press., Static (Pstat)	



Stack Diagram

ALT-011

Std TC (ID/°F) —

Stack TC (ID/°F) —

Continuity Check ↑ or ↓

Client: Clearwater
Facility Location: Lewiston, ID
Source: M+D #2
Sample Location: 1B

Probe Heat Set	—	°F		
Filter		Heat Set	—	°F
Meter Box ID	LM 3	Y	.98847	
System / Leak Check	Pretest: .00	Lpm	12	inHg
	Post: .00	Lpm	15	inHg

No more than 0.04 Lpm @ ≥ 10 inHg

System / Leak Check	Pretest: —	cfm	—	inHg
	Post: —	cfm	—	inHg

No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L — Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft — Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm (2 Lpm = 0.07 cfm)	Exit Imp ~~STACK~~ °F (Ts)	MFC Temp ~~PROBE~~ °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)
	923	00.000			Amb:	Amb:	Amb:	Amb:	Amb:	
5		4.91		1.4pm	69	70		78	78	2
10		9.90			67	72		79	79	2
15		14.83			69	74		79	79	3
20	~~940~~ 1003	20.02			74	76		80	80	8
25		25.11			69	82		85	85	7
30		30.27			66	84		86	86	8
35		35.17			67	85		87	87	8
40		40.46			67	85		88	88	9
45		45.36			66	81		88	88	10
50		50.21			66	86		89	89	10
55		55.30			67	83		89	89	10
60	1043	60.55 547		✓	65	83		89	89	10
	54	(SS) 4-10-14								

Notes:

308

Method ~~26~~ Field Data Sheet

HORIZON ENGINEERING

Client: Clearwater
Facility Location: Lewiston, ID
Source: MTD #2
Sample Location: 1B

Date	4-10-14	Probe Heat Set	— °F
Test Method	308	Filter	Heat Set — °F
Concurrent Testing	-	Meter Box ID	LM 3 Y .98447
Run #	3	System Leak Check	Pretest: .00 Lpm /3 inHg; Post: .00 Lpm /4 inHg
Operator KRK	Support SS		No more than 0.04 Lpm @ ≥ 10 inHg
Temperature, Amb (Ta)		Std TC (ID/°F) —	System Leak Check: Pretest: — cfm — inHg; Post: — cfm — inHg
Moisture —	Tdb — Twb —	Stack TC (ID/°F) —	
Press., Bar (Pb)	29.6	Continuity Check ↑ or ↓	
Press., Static (Pstat)			No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Stack Diagram
ALT-011

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L; Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft; Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm 2 Lpm = 0.07 cfm	Exit Imp. ~~STACK~~ °F (Ts)	MFL Temp ~~PROBE~~ °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)
	1056	00.000	.		Amb:	Amb:	Amb:	Amb:	Amb:	
5		5.00	.	1 Lpm	71	80		88	88	3
10		10.07	.		70	82		88	88	5
15		15.00	.		70	80		88	88	7
20		20.10	.		71	80		87	87	8
25		25.06	.		71	82		87	87	9
30		30.07	.		72	82		88	88	9
35		35.09	.		72	82		88	88	9
40		40.23	.		68	84		89	89	10
45		45.09	.		68	86		89	89	10
50		49.90	.		68	87		90	90	10
55		55.21	.		68	86		91	91	10
60	1156	60.171	.		68	85		91	91	10
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Notes:

308

Method 26 Field Data Sheet

HORIZON ENGINEERING

Client: Clearwater
Facility Location: Lewiston ID
Source: M+D 2
Sample Location: 2B

Date 4/11/14
Test Method 308
Concurrent Testing —
Run # 1
Operator KRK Support JS/TL
Temperature, Amb (Ta)
Moisture — Tdb — Twb —
Press., Bar (Pb)
Press., Static (Pstat)

Stack Diagram
ALT-011
Std TC (ID/°F) —
Stack TC (ID/°F) —
Continuity Check ↑ or ↓

Probe Heat Set — °F
Filter Heat Set — °F
Meter Box ID LM 3 Y .98847

System	Pretest:	00	Lpm 12	inHg
Leak Check	Post:	00	Lpm 13	inHg

No more than 0.04 Lpm @ ≥ 10 inHg

System	Pretest:	—	cfm —	inHg
Leak Check	Post:	—	cfm —	inHg

No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L; Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft; Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm (2 Lpm = 0.07 cfm)	Ext Imp ~~STACK~~ °F (Ts)	MFC Temp ~~PROBE~~ °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)
	745	00.000			Amb:	Amb:	Amb:	Amb:	Amb:	
5		4.81		1 Lpm	64	84		84	84	2
10		10.39			59	79		84	84	7
15		15.32			59	81		84	84	8
20		20.15			59	81		84	84	8
25		25.03			60	81		84	84	8
30		30.32			62	82		84	84	9
35		35.38			64	84		85	85	9
40		40.30			60	78		85	85	9
45		45.00			59	74		85	85	9
50		50.11			56	71		83	83	10
55		55.19			57	69		81	81	10
60	845	60.06		↓	58	64		79	79	10

Notes:

308

Method ~~26~~ Field Data Sheet

Client: Clearwater
Facility Location: Lewiston ID
Source: M+D #2
Sample Location: 2B

Date 4/12/14
Test Method 308
Concurrent Testing —
Run # ~~1~~ 2 KRK
Operator KRK Support TL, JS
Temperature, Amb (Ta) 90
Moisture — Tdb — Twb —
Press., Bar (Pb)
Press., Static (Pstat)

Stack Diagram
ALT-011
Std TC (ID/°F) —
Stack TC (ID/°F) —
Continuity Check ↑ or ↓

Probe Heat Set — °F
Filter Heat Set — °F
Meter Box ID LMB 3 Y

System	Pretest: .00	Lpm 12	inHg
Leak Check	Post: .00	Lpm 15	inHg

No more than 0.04 Lpm @ ≥ 10 inHg

System	Pretest: —	cfm —	inHg
Leak Check	Post: —	cfm —	inHg

No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L: Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft: Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm (2 Lpm = 0.07 cfm)	~~Exh Dmp STACK~~ °F (Ts)	MFC Temp ~~PROBE~~ °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)
	700	00.000			Amb:	Amb:	Amb:	Amb:	Amb:	
5		5.06		1 Lpm	75	91		99	99	3
10		9.99			73	91		98	98	9
15		15.20			72	91		98	98	10
20		20.39			68	91		98	98	10
25		25.24			68	91		98	98	11
30		30.13			68	91		97	97	11
35		35.20			66	92		97	97	11
40		40.22			62	92		97	97	11
45		45.15			64	92		97	97	11
50		50.12			66	92		96	96	11
55		54.98			67	92		97	97	12
60	800	60.303			68	92		97	97	13

Notes:

308

Method 26 Field Data Sheet

HORIZON ENGINEERING

Client: Clearwater
Facility Location: Lewiston DD
Source: M+D #2
Sample Location: 2B

Date 4/12/14
Test Method 308
Concurrent Testing —
Run # 3
Operator KRK Support TL, JS
Temperature, Amb (Ta)
Moisture — Tdb — Twb —
Press., Bar (Pb)
Press., Static (Pstat)

Stack Diagram
ALT-011
Std TC (ID/°F) —
Stack TC (ID/°F) —
Continuity Check ↑ or ↓

Probe Heat Set — °F
Filter Heat Set — °F
Meter Box ID 2MB3 Y .98847
System Leak Check — Pretest: .00 Lpm 11 inHg — Post: .00 Lpm 15 inHg
No more than 0.04 Lpm @ ≥ 10 inHg
System Leak Check — Pretest: — cfm — inHg — Post: — cfm — inHg
No more than 0.0014 cfm @ ≥ 10 inHg (0.004 in 3 mins)

Sampling Time min (dt)	Clock Time (24 hr)	Minimum volume required in 1 hour 120 L ± 12 L: Liter Meter Reading L (Vm)	Minimum volume required in 1 hour 4.25 cuft ± 0.43 cuft: Dry Gas Meter Reading cuft (Vm)	Sampling Rate Lpm OR cfm (2 Lpm = 0.07 cfm)	~~Exh Dwg~~ ~~STACK~~ °F (Ts)	MFC Temp PROBE °F (Tp)	OVEN Filter °F (To)	METER Inlet/Avg. °F (Tm-in)	METER Outlet °F (Tm-out)	Pump Vacuum inHg (Pv)
	814	00.000			Amb:	Amb:	Amb:	Amb:	Amb:	
5		5.06		1.4pm	58	83		92	92	3
10		9.98			58	85		92	92	7
15		15.08			61	88		91	91	8
20		20.30			63	89		92	92	9
25		25.36			65	88		92	92	10
30		30.29			65	84		93	93	10
35		34.96			63	83		93	93	10
40		40.15			63	86		92	92	11
45		45.29			64	88		92	92	11
50		50.06			65	89		92	92	12
55		55.16			66	84		92	92	12
60	914	60.326		↓	63	86		92	92	13

Notes:

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VOLUME FLOWRATE MEASUREMENT

Cyclonic Flow (y/n):
Barometric (inHg): 29.6
Pitot ID/Cp: SR 36-2
Pitot Insp. (NC/D):
Gauge ID: SR 4 4
Duct Dimensions: See M1

Stack Temperature:
Std. TC (ID/°F): TL / 81 Continuity
Stack TC (ID/°F): N/A ↑ or ↓
Wet Bulb/Dry Bulb:
Std. TC (ID/°F): TL / 81 Continuity
Stack TC (ID/°F): 200/01 ↑ or ↓

Client: Clearwater Paper
Date: 4-8-14
Facility Location: Lewiston, ID
Source: RTO #1
Sample Location: Horizontal Flow Ports
Operator: TL, JS

Run #	1	1	2	2	3	3	4(1)	4(1)	5(2)	5(2)
Time	0845	0845	1035	1035	1140	1140	14:16	14:16	16:16	
	ΔP	Tdb °	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb
1	.127	210	.2918	211	.194	211	.4579	212	.2329	212
2	.287	210	.2960	211	.356	211	.3813	212	.2956	212
3	.496	210	.4432	211	.302	211	.4579	212	.3428	212
4	.653	210	.7356	211	.567	211	.3527	212	.5725	212
5	.2215	210	.3930	211	.435	211	.4543	212	.2566	212
6	.3221	210	.2854	211	.301	211	.3182	212	.2546	212
7	.3524	210	.5299	211	.234	211	.6355	212	.2067	212
8	.408	210	.8117	211	.113	211	.3168	212	.1218	212
1	.1236	210	.2815	211	.284	211	.1807	212	.2124	212
2	.2814	210	.2863	211	.507	211	.2181	212	.2680	212
3	.4012	210	.4106	211	.431	211	.1574	212	.3107	212
4	.6016	210	.7102	211	.479	211	.1439	212	.4340	212
5	.2107	210	.3814	211	.329	211	.1279	212	.3022	212
6	.5209	210	.1678	211	.202	211	.1306	212	.1963	212
7	.3409	210	.2899	211	.156	211	.1426	212	.1855	212
8	.3106	210	.8104	211	.119	211	.4138	212	.2158	212
			Method 308 Runs				SUMMA CANISTER RUNS			
							(Actually Runs 1, 2, 3)			

SEE PHOTOGRAPH 1A — Flow ports

Leak Check (inches in 15 secs)										
Positive	0" H2O @ 6" H2O		0" H2O @ 5" H2O		0" H2O @ 6" H2O		0" H2O @ 6" H2O		0" H2O @ 8" H2O	
Negative	0" H2O @ 6" H2O		0" H2O @ 5" H2O		0" H2O @ 5" H2O		0" H2O @ 5" H2O		0" H2O @ 7" H2O	
Pstat	-.1825		-.192		-.163		-.125		.179	
Twb		209.3		211		211		212		212
Static press., in H2O		210								
Wet bulb temp., F										

* Temp across traverse assumed to be consistent during flow traverse / impossible to traverse a TC with the pitot, verified during wet bulb / dry bulbs.

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Cyclonic Flow (y/n):		Stack Temperature:	Client: Clearwater
Barometric (inHg):	29.6	Std. TC (ID/°F): — Continuity	Date: 4/8/14
Pitot ID/Cp:	SR 36-2	Stack TC (ID/°F): ↑ or ↓	Facility Location: Lewiston, ID
Pitot Insp. (NC/D):		Wet Bulb/Dry Bulb:	Source: MWD #1
Gauge ID:	SR#4	Std. TC (ID/°F): — Continuity	Sample Location: 1A
Duct Dimensions:	See M1	Stack TC (ID/°F): ↑ or ↓	Operator: TL, JS, KRF

Run #	6 (3)	6 (3)								
Time	1741	1741								
	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb
1	.1246	2/2								
2	.1470	2/2								
3	.2103	2/2								
4	.1817	2/2								
5	.3490	2/2								
6	.5289	2/2								
7	.1690	2/2								
8	.1222	2/2								
1	.1544	2/2								
2	.1254	2/2								
3	.1427	2/2								
4	.2075	2/2								
5	.4038	2/2								
6	.6600	2/2								
7	.3020	2/2								
8	.2184	2/2								

Leak Check (inches in 15 secs)										
Positive	0 " H2O @ 5 " H2O		__ " H2O @ __ " H2O		__ " H2O @ __ " H2O		__ " H2O @ __ " H2O		__ " H2O @ __ " H2O	
Negative	0 " H2O @ 5 " H2O		__ " H2O @ __ " H2O		__ " H2O @ __ " H2O		__ " H2O @ __ " H2O		__ " H2O @ __ " H2O	
Pstat	-.2265									
Twb										

Static press., in H2O	
Wet bulb temp., F	

1 of 2

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Cyclonic Flow (y/n):		Stack Temperature:	Client: Clearwater
Barometric (inHg):	30.3	Std. TC (ID/°F): TL / 83.5 Continuity	Date: 4-9-14
Pitot ID/Cp:	SR 36-2	Stack TC (ID/°F): NO ID / 81.7 ↑ or ↓	Facility Location: Lewiston, ID
Pitot Insp. (NC/D):	NC /	Wet Bulb/Dry Bulb:	Source: M&D # 1
Gauge ID:	SR #4	Std. TC (ID/°F): TL / 83.5 Continuity	Sample Location: 2A
Duct Dimensions:	See M1	Stack TC (ID/°F): NO ID / 85.0 ↑ or ↓	Operator: TL

Run #	1	1	2	2	3	3	4(1)	4(1)	5(2)	5(2)
Time	9:28	9:28	10:53	10:53	12:36	12:36	14:58	14:58	14:58	14:58
	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb
1	.1179	212	.2584	212	.2577	212	.3301	212	.5743	212
2	.6347	212	.3914	212	.2570	212	.3560		.5508	
3	.5147	212	.2269	212	.2364	212	.4304		.4691	
4	.5631	212	.2261	212	.2662	212	.2517		.5657	
5	.3395	212	.2726	212	.2940	212	.2634		.5300	
6	.5721	212	.2355	212	.2940	212	.3891		.6701	
7	.4737	212	.3287	212	.2705	212	.2415		.4232	
8	.2561	212	.2347	212	.3437	212	.2809		.7397	
		(TL)	~~.5350~~							
1	.7051	212	.5350	212	.4251	212	.4247		.2724	
2	.6223	212	.5624	212	.4958	212	.2675		.5501	
3	.7037	212	.2479	212	.4229	212	.2600		.2768	
4	.8378	212	.6143	212	.4363	212	.3560		.4698	
5	.4788	212	.5168	212	.2802	212	.3893		.1141	
6	.4888	212	.2389	212	.3388	212	.3993		.4984	
7	.3034	212	.4303	212	.2617	212	.4626		.2481	
8	.6156	212	.2685	212	.2830	212	.5348		.3064	
		*								
		Additional wb / Temperatures								
		for runs as described in notes: Db								
					12:33	211/212	SAME		SAME	
					12:50	211/212	SAME		SAME	
					13:05	211/212	SAME		SAME	
					13:15	211/212				
					13:26	211/212				
Leak Check (inches in 15 secs)						End of run				
Positive	0 " H2O @ 6 " H2O		0 " H2O @ 5 " H2O		0 " H2O @ 9 " H2O		0 " H2O @ 8 " H2O		0 " H2O @ 6 " H2O	
Negative	0 " H2O @ 5 " H2O		0 " H2O @ 4 " H2O		0 " H2O @ 10 " H2O		0 " H2O @ 7 " H2O		0 " H2O @ 7 " H2O	
Pstat	-.1652		-.1709		-.1642		-.1650		-.1002	
Twb	~~217~~		~~217~~			211		211		211
Static press., in H2O	211 (TL)		211 (TL)							
Wet bulb temp., F										

* Same assumption made for temperatures as on 4-8-14 1A flow sheet.

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Cyclonic Flow (y/n):		Stack Temperature: SEE RUNS 1-5	Client: Clearwater Paper
Barometric (inHg):	30.3	Std. TC (ID/°F): _____ Continuity	Date: 4/9/14
Pitot ID/Cp:	S-84 36-2	Stack TC (ID/°F): ↑ or ↓	Facility Location: Lewiston, Id
Pitot Insp. (NC/D):	NC	Wet Bulb/Dry Bulb: SEE RUNS 1-5	Source: M5 D#1
Gauge ID:	SEAH	Std. TC (ID/°F): _____ Continuity	Sample Location: Sample Point 2A
Duct Dimensions:	See M1	Stack TC (ID/°F): ↑ or ↓	Operator: TL, JS

Run #	6(3)	6(3)								
Time	1617	1617								
	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb
1	.2301	212								
2	.2973									
3	.2269									
4	.2256									
5	.2374									
6	.2146									
7	.2612									
8	.3094									
1	.5251	212								
2	.4073									
3	.5159									
4	.6662									
5	.6168									
6	.4204									
7	.4623									
8	.3385									

Leak Check (inches in 15 secs)										
Positive	2" H2O @ 6" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O	
Negative	2" H2O @ 5" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O	
Pstat	-.1501									
Twb		211								
Static press., in H2O										
Wet bulb temp., F										

*See note on runs #1-5 datasheet

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VOLUME FLOWRATE MEASUREMENT

1 of 2

Cyclonic Flow (y/n):
Barometric (inHg): 29.6
Pitot ID/Cp: S2 36-2
Pitot Insp. (NC/D): NC /
Gauge ID: S2 H 4
Duct Dimensions: See M1

Stack Temperature:
Std. TC (ID/°F): TL / 80.6° Continuity
Stack TC (ID/°F): NO ID / 81.3 ↑ or ↓
Wet Bulb/Dry Bulb:
Std. TC (ID/°F): TL / 80.6° Continuity
Stack TC (ID/°F): NO ID / 82.0 ↑ or ↓

Client: Clearwater Paper
Date: 4/10/14
Facility Location: Lewiston, ID
Source: M&D #2
Sample Location: Sample Point 1B
Operator: TL, JS

Run #	1	1	2	2	3	3	4(1)	4(1)	5(2)	5(2)
Time	09:10	09:10	09:14	09:14	12:20	12:20	~~1506~~ TL	~~1505~~ TL	15:10	15:10
	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP 12:56	Tdb 12:56	ΔP	Tdb
1	.1779	212	.1631	212	.2314	.3164	→	213	.3317	213
2	.5055	↓	.1116	↓	.3198	.6901	→	↓	.6473	↓
3	.1318		.1218		.1538	.3367	→		.3941	
4	.2083		.5252		.1440	.6002	→		.3199	
5	.4264		.6818		.2853	.2152	→		.3723	
6	.1140		.1010		.1674	.5471	→		.3875	
7	.1866		.1688		.1959	.3263	→		.2688	
8	.7424	↓	.6385	↓	.2719	.8842	→	↓	.2703	↓
						↑				
1	.4356	212	.5858	212	.1654	213	.3277	213	.2325	213
2	.3885	↓	.4029	↓	.2934	↓	.6522	↓	.2230	↓
3	.6935		.2401		.3429		.2434		.2835	
4	.3166		.4785		.2136		.7936		.4252	
5	.6171		.4832		.1331		.5471		.2199	
6	.3510		.4580		.3033		.4283		.2943	
7	.2401		.2764		.1825		.6588		.2722	
8	.4785	↓	.5196	↓	.2709	↓	.4365	↓	.3502	↓
	Time	Wb/Db	Time	Wb/Db	Time	Wb/Db	Time	Wb/Db	Time	Wb/Db
	08:00	211/212	0925	211/212	1100	212/213	~~1353~~	211/213	~~1500~~	212/213
	08:10	211/212	0935	211/212	1120	212/213	~~1403~~	212/213	~~1510~~	212/213
	08:25	211/212	0945	211/212	1130	212/213	1413	212/213	~~1520~~	212/213
	08:40	212/213	0955	212/213	1140	212/213	~~1423~~	212/213	~~1530~~	212/213
			1005	212/213	1150	212/213	1433	212/213	~~1540~~	212/213
			1020	212/213			~~1443~~	212/213	~~1550~~	212/213
			1040	212/213			~~1453~~	212/213	~~1600~~	212/213
			Avg	211.625/212.625			ΔTL 4/10 14, SEE SUMMA DATASHEET			

Leak Check (inches in 15 secs)

Positive	0" H2O @ 6" H2O		0" H2O @ 5" H2O		0" H2O @ 4" H2O		0" H2O @ 5" H2O		0" H2O @ 6" H2O	
Negative	0" H2O @ 5" H2O		0" H2O @ 4" H2O		0" H2O @ 5" H2O		0" H2O @ 5" H2O		0" H2O @ 7" H2O	
Pstat	-.2015		-.1640		-.0108		-.1025		-.1236	
Twb		211		211		212		213		213
Static press., in H2O										
Wet bulb temp., F										

* Same assumption made as on flow sheets from 4/8/14 and 4/9/14

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VOLUME FLOWRATE MEASUREMENT

2 of 2

Cyclonic Flow (y/n):		Stack Temperature:					Client:	Clearwater Paper			
Barometric (inHg):	29.6	Std. TC (ID/°F):	SEE SHEET		Continuity		Date:	4/10/14			
Pitot ID/Cp:	S2 36-2	Stack TC (ID/°F):	#1		↑ or ↓		Facility Location:	Lewiston, ID			
Pitot Insp. (NC/D):	NC	Wet Bulb/Dry Bulb:					Source:	M5 #2			
Gauge ID:	SEN4	Std. TC (ID/°F):	SEE SHEET		Continuity		Sample Location:	18			
Duct Dimensions:	See M1	Stack TC (ID/°F):	#1		↑ or ↓		Operator:	TL, JS			

Run #	6(3)	6(3)								
Time	15:12	15:12								
	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb
1	.3312	213								
2	.3646									
3	.2517									
4	.2909									
5	.4217									
6	.6150									
7	.8102									
8	.2162	↓								
1	.2404	213								
2	.2612									
3	.2815									
4	.4163									
5	.2209									
6	.2806									
7	.2907									
8	.2114	↓								

Leak Check (inches in 15 secs)										
Positive	2" H2O @ 6 " H2O		8" H2O @ 5 " H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O	
Negative	2" H2O @ 5 " H2O		8" H2O @ 6 " H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O	
Pstat	-.1647									
Twb		211								
Static press., in H2O										
Wet bulb temp., F										

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VOLUME FLOWRATE MEASUREMENT

Cyclonic Flow (y/~~n~~): N/A (2)
Barometric (inHg): 29.6
Pitot ID/Cp: SR36-2
Pitot Insp. (NC/D): NC/
Gauge ID: 5284
Duct Dimensions: See M1

Stack Temperature:
Std. TC (ID/°F): TL — Continuity ↑ or ↓
Stack TC (ID/°F): 200901
Wet Bulb/Dry Bulb:
Std. TC (ID/°F): TL — Continuity ↑ or ↓
Stack TC (ID/°F): DB-1

Client: Clearwater
Date: 4-11-13/4-12-13
Facility Location: Lewiston, ID
Source: M+D #2
Sample Location: 2B
Operator: JS/TL

Run #	1	1	2	2	3	3	4	4	5	5
Time	0840	0840	0857	0857	0900	0900	0944	0944	1110	1110
	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb
1	.1074	212	.2382	212	.1674	212	.0962	212	.1856	212
2	.3413		.3619		~~.3151~~ .2366		.2195		.2821	
3	.4370		.1942		.1622		.4089		.3108	
4	.2228		.3568		.1145		.2662		.2471	
5	.2635		.2567		.3490		.3400		.3961	
6	.2156		.3369		.2042		.2292		.1591	
7	.2885		.2300		.2261		.1710		.2179	
8	.1792		.2240		.1842		.1964		.1536	
1	.1952		.2164		.2151		.1337	212	.1869	
2	.3136		.3409		.2673		.3927		.3162	
3	.6062		.2085		.2012		.4652		.2908	
4	.5105		.4617		.2186		.2911		.4519	
5	.2317		.5102		.3627		.2849		.3741	
6	.1932		.3216		.2243		.2374	.2668	.0894	
7	.2261		.2169		.1584		.1201		.1614	
8	.2109		.2515		.1742		.1618		JS 4-12-14 .1194	
	Time	Wb/Db	Time	Wb/Db	Time	Wb/Db	Time	Wb/Db	Time	Wb/Db
	0755	210/212	0705	211/213	0815	210/212	0930	210/212	1035	211/212
	0810	210/212	0720	211/212	0830	210/212	0945	211/212	1050	211/212
	0825	210/212	0735	211/212	0845	210/212	1000	211/212	1105	211/212
	0840	210/212	0750	210/212	0900	210/212	1015	211/212	1120	211/212

Leak Check (inches in 15 secs)										
Positive	2" H2O @ 6" H2O		2" H2O @ 5" H2O		0" H2O @ 5" H2O		0" H2O @ 6" H2O		__" H2O @ __" H2O	
Negative	2" H2O @ 5" H2O		2" H2O @ 5" H2O		0" H2O @ 6" H2O		0" H2O @ 6" H2O		__" H2O @ __" H2O	
Pstat	-.1586		-.2014		-.1436		-.1892		-.0941	
Twb		210		210		210				
Static press., in H2O					start @ 0814		start @ 9:24		start @ 1031	
Wet bulb temp., F										

B:\Shared files\Field\Data Sheets\Method 2\Method 2_v4.pdf

Notes: Run #1 occurred on 4-11-14
#2 and after occurred on 4-12-14

VOLUME FLOWRATE MEASUREMENT

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Cyclonic Flow (y/n):		Stack Temperature:	Client: Clearwater
Barometric (inHg):	29.6	Std. TC (ID/°F): TL	Continuity Date: 4-12-14
Pitot ID/Cp:	SR 36-2	Stack TC (ID/°F): 200901	↑ or ↓ Facility Location: Lewiston, ID
Pitot Insp. (NC/D):	NC	Wet Bulb/Dry Bulb:	Source: M4 D #2
Gauge ID:	SR #4	Std. TC (ID/°F): TL	Continuity Sample Location: 2B
Duct Dimensions:	See M1	Stack TC (ID/°F): DB-1	↑ or ↓ Operator: JS/TL

Run #	6	6								
Time	1145	1145								
	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb	ΔP	Tdb
1	.1380	212								
2	.3366	↓								
3	.1990	↓								
4	.3320	↓								
5	.1436	↓								
6	.4226	↓								
7	.2969	↓								
8	.1042	↓								
1	.3488	212								
2	.2208	↓								
3	.2608	↓								
4	.5309	↓								
5	.3111	↓								
6	.4004	↓								
7	.2314	↓								
8	.1169	↓								
	Time	wb/Db								
	1140	211/212								
	1155	211/212								
	1210	↓/↓								
	1225	↓/↓								

Leak Check (inches in 15 secs)										
Positive	0" H2O @ 6" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O	
Negative	0" H2O @ 5" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O		___" H2O @ ___" H2O	
Pstat	-.0276									
Twb		211								
Static press., in H2O										
Wet bulb temp., F										

start @ 1135

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Client Clearwater Paper
Plant Lewiston, ID
Sampling Location MHD #1, 1A
Test Conditions Normal
Initials JS

Run # (4)	Time	Wet Bulb	Dry Bulb	MFC temp	Sumona Flow cont. Temp	
start @ 1403 4	1405	212	212	96	92	
	1415	212	212	99	93	
	1419	212	212	98	89	
	1427	212	212	98	89	
	1437	212	212	97	89	
	1447	211	211	98	91	
	1457	211	211	98	92	
End Run #4	1503	211	211	98	92	
start @ 1518 5 (2)	1519	211	211	99	92	
	1529	211	211	100	94	
	1539	212	212	102	99	
	1549	212	212	101	100	
	1559	212	212	102	100	
	1609	212	212	103	100	
End of Run 5	1618	212	212	103	100	
start @ 1638 Run 6 (3)	1638	211	211	104	95	
	1644-1651	211	211	104	93	
	1701	212	212	104	94	
	1711	212	212	105	98	
	1721	212	212	104	94	
	1731	212	212	104	94	
End run 6 (3)	1738	212	212	105	99	

1417 opened valve on Run 1

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Client Clearwater Paper
Plant Lewiston, ID
Sampling Location M+D #1, 2A
Test Conditions Normal
Initials JS

Run #	Time	Wet Bulb	Dry Bulb	MFC temp	Summa Flow cont. Temp	
start @ 1340 4(1)	1340	211	212	94	88	
	1350	211	212	94	88	
	1400	211	212	94	90	211/212
	1410	211	212	94	91	
	1420	211	212	94	90	
	1430	211	212	94	90	
End of Run	1440	211	212	94	90	
start @ 1447	1447	212	213	92	90	
5(2)	1457	~~211~~ 211	212	91	89	
	1507	211	212	91	89	
	1517	211	212	90	88	211.4/212.4
	1527	212	213	90	88	
	1537	212	213	90	88	
	1547	211	212	92	89	
start @ 1555 6(3)	1555	212	213	92	85	
	1608	212	213	91	87	
	1615	212	213	91	87	
	1625	212	213	92	88	212/213
	1635	212	213	93	89	
	1645	212	213	92	89	
End test	1655	212	213	92	89	

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Client Clearwater Paper
Plant Lewiston, Id
Sampling Location M&D ~~#2~~ Sample Point ~~2A~~ 2B
Test Conditions Normal
Initials JS
Date: 4-10-14
JS 4-10-14

Run #4	Time	Wet Bulb	Dry Bulb	MFC temp	Summa Flow Cont. Temp	
Start @ 12:46 (1)	1246	212	213	94	92	
	1256	212	213	95 KEK	92	
	1306	212	213	~~93~~ 95	93	
	1316	212	213	96	94	
	1326	212	213	97	95	
	1336	212	213	97	96	
	1346	212	213	98	96	
Start @ 1353 Run 5 (2)	1353	212	213	98	94	
	1403	212	~~213~~	99	94	
	1413	212	213	99	94	
	1423	212	213	100	95	
	1433	212	213	100	94	
	1443	212	213	100	93	
	1453	212	213	100	94	
Start @ 1500 Run 6 (3)	1500	212	213	101	94	
	1510	212	213	102	96	
	1520	212	213	102	97	
	1530	212	213	103	98	
	1540	212	213	103	98	
	1550	212	213	103	98	
	1600	212	213	103	98	

Notes: TC used for MFC Temp = TL
TC used for Summa temp = JS

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Client Clearwater
Plant Lewiston ID
Sampling Location M+D #2 2B
Test Conditions
Initials TL/JS/KEK

Run #	Time	Wet Bulb	Dry Bulb	MFC temp	Summa Flow cont. Temp	
4 (1) start @ 924	924	210	212	91	77	
	936	210	212	90	77	
	948	211	212	89	71	
	954	211	212	89	74	
	1004	211	212	84	68	
	1014	211	212	85	75	
	1024	211	212	89	82	
5 (2) start @ 1031	1031	211	212	90	79	
	1043	211	212	92	91	
	1055	211	212	87	84	
	1106	211	212	85	76	
	1118	211	212	84	73	
	1130	211	212	88	84	
6 (3) start @ 1135	1135	211	212	78	74	
	1145	211	212	72	70	
	1155	211	212	72	70	
	1205	211	212	69	70	
	1215	211	212	70	70	
	1225	211	212	67	69	
	1235	211	212	68	70	

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EPA Method 308 Sample Recovery Worksheet

Client: Clearwater | Date: 4/9/14
Facility Location: Lewiston ID | Source: M+D 1
Operator: JH | Sample Location: 1A

Balance Calibration (1000, 500, 200 g) Tolerance must be within ± 1.0%
Need one per each 3-run test: 995.5 / 499.2 / 199.7

	1159	1212.4	105.3 cond+rinse
MIDGET IMPINGER CONTENTS	**RUN 1**	**RUN 2**	**RUN 3**
Impinger, contents & condensate (g)	1100.9	1112.3	978
Empty impinger (g)	100.3	99.1	100
Initial volume (ml)	100	NA	NA
Initial contents	DI	NA	NA
Condensate appearance	cloudy	cloudy	cloudy
VOA vial & condensate (g)	64.1	64.0	63.9
Empty VOA vial (g)	21.6	21.5	21.3

SILICA GEL

Appearance		pink	pink	pink
	Flow	30A00144	30A00046 ~~261.9~~ ~~269.0~~ SSC00031	30A00099 SSC00208
	rotimer	SSC00224		
TRS moisture catch	Final	299.1	295	314
	initial	266	264	206

SSC00003 - Blown run ~~tube~~ + gauge was mistaken for flow controller

3 impingers used for TRS spiking

Sample Recovery / Moisture Catch

Clearwater Paper Corp.
M & D Digester #1-pt1A
Lewiston, ID

8-Apr-14
JH

MEW

Definitions	Symbol	Units	1	2	3
Impinger Contents					
	Impinger, Contents,Condensate & Rinse	g	1159.0	1212.4	1050.8
	Impinger, Contents & Condensate	g	1100.9	1112.3	978.0
spg (g/ml)	Impinger	g	100.3	99.1	100.0
0.99823	H2O Intial contents	ml	100.0	0.0	0.0
	Total sample	g	1058.7	1113.3	950.8
		ml	1060.6	1115.3	952.5
	Condensate	g	900.8	1013.2	878.0
		ml	902.4	1015.0	879.6
	Water Rinse & Intial	g	157.9	100.1	72.8
		ml	158.2	100.3	72.9
	VOA vial & Sample	g	64.1	64.0	63.9
	VOA vial	g	21.6	21.5	21.3
	Sample	g	42.5	42.5	42.6
		ml	42.6	42.6	42.7
	Dilution Factor		24.91	26.20	22.32

md_1_pt_1A.xls

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EPA Method 308 Sample Recovery Worksheet

Client: Clearwater
Facility Location: Lewiston ID
Operator: JH
Date: 4/9/14
Source: M+R 1
Sample Location: 2A

Balance Calibration (1000, 500, 200 g) Tolerance must be within ± 1.0%
Need one per each 3-run test: 998.4 / 1499.21 / 199.7

	1024.5	1062.3	1030.0
MIDGET IMPINGER CONTENTS	**RUN 1**	**RUN 2**	**RUN 3**
Impinger, contents & condensate (g)	931	1107.6	958.1
Empty impinger (g)	100.1	100.2	99.1
Initial volume (ml)	NA	NA	NA
Initial contents	NA	NA	NA
Condensate appearance	cloudy	cloudy	cloudy
VOA vial & condensate (g)	63.6	63.4	63.6
Empty VOA vial (g)	21.1	21.2	21.6
SILICA GEL			
Appearance	pink	pink	pink
	SOA 00146	SOA 00056	SOA 00015
	SSC 00213	SSC 00092	SSC 00229
	317.2	395.9	302.5
Empty	265.3	265.6	265.5

Sample Recovery / Moisture Catch

Clearwater Paper Corp.
M & D Digesters 1 - pt2A
Lewiston, ID

9-Apr-14
JH

MEW

Definitions	Symbol	Units	1	2	3
Impinger Contents					
	Impinger, Contents,Condensate & Rinse	g	1024.5	1162.3	1030.0
	Impinger, Contents & Condensate	g	931.0	1104.6	958.1
spg (g/ml)	Impinger	g	100.1	100.2	99.1
0.99823	H2O Intial contents	ml	0.0	0.0	0.0
	Total sample	g	924.4	1062.1	930.9
		ml	926.0	1064.0	932.6
	Condensate	g	830.9	1004.4	859.0
		ml	832.4	1006.2	860.5
	Water Rinse & Intial	g	93.5	57.7	71.9
		ml	93.7	57.8	72.0
	VOA vial & Sample	g	63.6	63.4	63.6
	VOA vial	g	21.1	21.2	21.6
	Sample	g	42.5	42.2	42.0
		ml	42.6	42.3	42.1
	Dilution Factor		21.75	25.17	22.16

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EPA Method 308 Sample Recovery Worksheet

Client: Clearwater | Date: 4/10/14
Facility Location: Lewiston ID | Source: M+D 2
Operator: JH | Sample Location: 13

Balance Calibration (1000, 500, 200 g) Tolerance must be within ± 1.0%
Need one per each 3-run test: 999.4 / 499.3 / 199.7

MIDGET IMPINGER CONTENTS	RUN 1	RUN 2	RUN 3
Impinger, contents & condensate (g)	1160/665	1154.7/338.9	1166/495
Empty impinger (g)	100/95.8	99.2/100.3	100.2/99.1
Initial volume (ml)	NA	NA	NA
Initial contents	NA	NA	NA
Condensate appearance	cloudy	cloudy	cloudy
VOA vial & condensate (g)	64.4	63.5	63.4
Empty VOA vial (g)	21.3	21.5	21.2

SILICA GEL

Appearance	white	white	white
	1626	1296	1451.7
	SOA 00052	SOA 00031 ~~SOA 00052~~ JH	~~SOA 00061~~ JH
	SSC 00212	~~SSC 00212~~ SH SSC 00014	~~SSC 00014~~ JH SOA 00160 SSC 00153
Clean + Blank 1200 SSC 00217 SOA 00064	329.2	344.5	343.6
	265.7	265.5	265.6

* 1st run moisture collection higher than R2

* spilled collected sample for R2 with client + EPA in truck. Zach doesn't think its a huge issue but he'll let me know if we have to redo the run

Sample Recovery / Moisture Catch

Clearwater Paper Corp.
M & D Digesters 2 - pt1B
Lewiston, ID

10-Apr-14
KRK

MEW

Definitions	Symbol	Units	1	2	3
Impinger Contents					
	Impinger, Contents,Condensate & Rinse	g	1894.6	1555.8	1741.0
	Impinger, Contents & Condensate	g	1825.0	1486.6	1651.0
spg (g/ml)	Impinger	g	198.8	199.5	199.3
0.99823	H2O Intial contents	ml	0.0	0.0	0.0
	Total sample	g	1695.8	1356.3	1541.7
		ml	1698.8	1358.7	1544.4
	Condensate	g	1626.2	1287.1	1451.7
		ml	1629.1	1289.4	1454.3
	Water Rinse & Intial	g	69.6	69.2	90.0
		ml	69.7	69.3	90.2
	VOA vial & Sample	g	64.4	63.5	63.4
	VOA vial	g	21.3	21.5	21.2
	Sample	g	43.1	42.0	42.2
		ml	43.2	42.1	42.3
	Dilution Factor		39.35	32.29	36.53

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EPA Method 308 Sample Recovery Worksheet

Client: Clearwater
Facility Location: Lewiston ID
Operator: JH
Date: 4/11/14 & 4/12/14
Source: M+D 2
Sample Location: 2 B

Balance Calibration (1000, 500, 200 g) Tolerance must be within ± 1.0%
Need one per each 3-run test: 499.2 / 1996.3 / 199.7
1131.5 697.7 / 1176.2 / 1097.3 / 1149.5 1149.4

MIDGET IMPINGER CONTENTS	RUN 1	RUN 2	RUN 3
Impinger, contents & condensate (g)	1131.5 / 1619.9	1176.2 / 1017.7	1135.3 / 1073.2
Empty impinger (g)	99.1 / 99	98.9 / 98.8	98.9 / 99
Initial volume (ml)	NA	NA	NA
Initial contents	NA	NA	NA
Condensate appearance	cloudy	cloudy	cloudy
VOA vial & condensate (g)	63.1	63.9	64.4
Empty VOA vial (g)	21.5	21.5	21.3

SILICA GEL

Appearance	~~pink~~/white JH	white	white
	SSC00162 SOA 00099	SSC0019 SOA00098	SOA00054 SSC 00099
	341.2 265.7	333 265	401.2 265.3

0830 - plant goes down, Bleach plant has issues

4/12/14 resume testing 0700

1140- Dirty Blank SOA 00837
SSC 00219

Sample Recovery / Moisture Catch

Clearwater Paper Corp.
M & D Digesters 2 - pt2B
Lewiston, ID

11-Apr-14
KRK

MEW

Definitions	Symbol	Units	1	2	3
Impinger Contents					
	Impinger, Contents,Condensate & Rinse	g	1819.2	2253.5	2298.9
	Impinger, Contents & Condensate	g	1750.6	2173.9	2208.5
spg (g/ml)	Impinger	g	198.1	197.6	197.9
0.99823	H2O Intial contents	ml	0.0	0.0	0.0
	Total sample	g	1621.1	2055.9	2101.0
		ml	1624.0	2059.5	2104.7
	Condensate	g	1552.5	1976.3	2010.6
		ml	1555.3	1979.8	2014.2
	Water Rinse & Intial	g	68.6	79.6	90.4
		ml	68.7	79.7	90.6
	VOA vial & Sample	g	63.1	63.9	64.4
	VOA vial	g	21.5	21.5	21.3
	Sample	g	41.6	42.4	43.1
		ml	41.7	42.5	43.2
	Dilution Factor		38.97	48.49	48.75

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May 1, 2014 Analytical Report for Service Request No: K1403722

Margery Heffernan
Horizon Engineering, LLC
13585 NE Whitaker Way
Portland, OR 97230

RE: Clearwater Paper Corp./5110

Dear Margery:

Enclosed are the results of the samples submitted to our laboratory on April 15, 2014. For your reference, these analyses have been assigned our service request number K1403722.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3293. You may also contact me via Email at Shar.Samy@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Shar Samy, Ph.D.
Project Manager

SS/mj

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEC UST	http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2286
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L12-28
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Georgia DNR	http://www.gaepd.org/Documents/techguide_pcb.html#cel	881
Hawaii DOH	Not available	-
Idaho DHW	http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx	-
Indiana DOH	http://www.in.gov/isdh/24859.htm	C-WA-01
ISO 17025	http://www.pjlabs.com/	L12-27
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	3016
Maine DHS	Not available	WA0035
Michigan DEQ	http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html	9949
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA35
New Jersey DEP	http://www.nj.gov/dep/oqa/	WA005
North Carolina DWQ	http://www.dwqlab.org/	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA200001
South Carolina DHEC	http://www.scdhec.gov/environment/envserv/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	4704427-08-TX
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C1203
Wisconsin DNR	http://dnr.wi.gov/	998386840
Wyoming (EPA Region 8)	http://www.epa.gov/region8/water/dwhome/wyomingdi.html	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.caslab.com or at the accreditation bodies web site

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

ALS ENVIRONMENTAL

Client:	Horizon Engineering, LLC	**Service Request No.:**	K1403722
Project:	Clearwater Paper Corp./ 5110	**Date Received:**	04/15/14
Sample Matrix:	Water and Misc. Solid		

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Control Sample (LCS), and Laboratory/Duplicate Laboratory Control Sample (LCS/DLCS).

Sample Receipt

Thirty-nine samples were received for analysis at ALS Environmental on 04/15/14. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

Methanol by EPA Method 308

Elevated Detection Limits:
The detection limit was elevated for Methanol in most samples. The sample extract was diluted prior to instrumental analysis due to relatively high levels of non-target background components. The samples were cloudy, and many had a visible oil sheen, which indicated the need to perform a dilution prior to injection into the instrument. The results were flagged to indicate the matrix interference.

No other anomalies associated with the analysis of these samples were observed.

Approved by_____

CHAIN OF CUSTODY

ALS Environmental

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SR# K1403722 106

PAGE 1 OF 3 COC#

PROJECT NAME: Clearwater Paper Corp.
PROJECT NUMBER: 5110
PROJECT MANAGER: Joe Hefferman
COMPANY NAME: Horizon Engineering
ADDRESS: 13585 NE Whitaker Way
CITY/STATE/ZIP: Portland OR 97230
E-MAIL ADDRESS: JHefferman@horizonengineering.com
PHONE #: 503 255 5050 FAX #: 503 255 0505
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐ SIM PAH☐	Volatile Organics 624☐ 8260☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCBs Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081☐ 8141☐ 8151☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	Metals, Total or Dissolved (See List below)	Cyanide☐ Hex-Chrom☐	(circle) pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS, Turb.	(circle) NH_3-N, COD, TKN, TOC, DOC, NO_2+NO_3, T-Phos	TOX 9020☐ AOX 1650☐ 506☐	Alkalinity ☐ CO_3 ☐ HCO_3 ☐	Dioxins/Furans 1613☐ 8290☐	Dissolved Gases CO_2☐ RSK 175☐ Methane☐ Ethane☐ Ethene☐	EPA 328: MeOH			REMARKS
M+DNo1 Pt 1A -R1	4/8/14	NA	1	Aqu	1																✓				
" -R1			2, 3	tube	1																✓				
" -R2			4	Aqu	1																✓				
" -R2			5, 6	tube	1																✓				
" -R3			7	Aqu	1																✓				
" -R3		PA	8, 9	tube	1																✓				
M+DNo1 Pt 2A-R1	4/10/14		10	Aqu	1																✓				
" -R1			11, 12	tube	1																✓				
" -R2			13	Aqu	1																✓				
" -R2			14, 15	tube	1																✓				

REPORT REQUIREMENTS

- ___ I. Routine Report: Method Blank, Surrogate, as required
- X II. Report Dup., MS, MSD as required
- ___ III. CLP Like Summary (no raw data)
- ___ IV. Data Validation Report
- ___ V. EDD

INVOICE INFORMATION

P.O. # 5110
Bill To: E. Bagwell

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 day
X Standard (15 working days)
___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: ___ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

all aqu samples are aliquots. Please measure + report all volumes.

For all tube samples analyze/report FH/BH separate

☐ Sample Shipment contains USDA regulated soil samples (check box if applicable)

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature]	Signature: [signature]	Signature:	Signature: [signature]
Date/Time: 4/15/14 850	Date/Time: 4-15-14 850	Date/Time:	Date/Time: 4/15/14 1130
Printed Name: [illegible]	Printed Name: [illegible]	Printed Name:	Printed Name: Holly Steele
Firm:	Firm: HES	Firm:	Firm: ALS

CHAIN OF CUSTODY

ALS Environmental

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SR# K1403722 107

PAGE 2 OF 3 COC#

PROJECT NAME Clearwater
PROJECT NUMBER 5110
PROJECT MANAGER
COMPANY NAME See page 1 of 3
ADDRESS
CITY/STATE/ZIP
E-MAIL ADDRESS
PHONE # FAX #
SAMPLER'S SIGNATURE [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS		Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐ SIM PAH ☐	Volatile Organics 624 ☐ 8260 ☐	Hydrocarbons (*see below) Gas ☐ 8021 ☐ BTEX ☐	Oil & Grease/TRPH 1664 HEM ☐ Diesel ☐ Oil ☐ 1664 SGT ☐	PCBs Aroclors ☐ Congeners ☐	Pesticides/Herbicides 608 ☐ 8081 ☐ 8141 ☐ 8151 ☐	Chlorophenolics - 8151M Tri ☐ Tetra ☐ PCP ☐	Metals, Total or Dissolved (See List below)	Cyanide ☐ Hex-Chrom ☐	(circle) pH, Cond., Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS, Turb.	(circle) NH3-N, COD, TKN, TOC, DOC, NO2+NO3, T-Phos	TOX 9020 ☐ AOX 1650 ☐ 506 ☐	Alkalinity ☐ CO3 ☐ HCO3 ☐	Dioxins/Furans 1613 ☐ 8290 ☐	Dissolved Gases RSK 175 ☐ Methane ☐ Ethane ☐ Ethene ☐ CO2 ☐	DPA 308 - MeOH			REMARKS
MtD No 1 Pt 2A-R3	4/12/14	NA	16	Aqu	1																	✓			
" -R3	↓		17, 18	tube	1																	✓			
MtD No. 2 Pt 1B-R1	4/10/14		19	Aqu	1																	✓			
" -R1			20, 21	tube	1																	✓			
" -R2			22	Aqu	1																	✓			
" -R2			23, 24	tube	1																	✓			
" -R3			25	Aqu	1																	✓			
" -R3	↓		26, 27	tube	1																	✓			
MtD No. 2 Pt 2B-R1	4/11/14		28	Aqu	1																	✓			
" -R1	↓	↓	29, 30	tube	1																	✓			

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required

X II. Report Dup., MS, MSD as required

___ III. CLP Like Summary (no raw data)

___ IV. Data Validation Report

___ V. EDD

INVOICE INFORMATION

P.O. # 5110

Bill To: E. Boswell

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.

___ 5 day

___ Standard (15 working days)

___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

***INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: ______ (CIRCLE ONE)**

SPECIAL INSTRUCTIONS/COMMENTS:

See page 1 of 3

☐ Sample Shipment contains USDA regulated soil samples (check box if applicable)

RELINQUISHED BY:		RECEIVED BY:		RELINQUISHED BY:		RECEIVED BY:	
[signature]	4/15/14 850	[signature]	4/15/14 850			[signature]	4/15/14 1130
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
[printed name]		[printed name]	ALS			Holly Steele	ALS
Printed Name	Firm	Printed Name	Firm	Printed Name	Firm	Printed Name	Firm

ALS Environmental

CHAIN OF CUSTODY

SR# K1403TVV

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PAGE 3 OF 3 COC#

PROJECT NAME: Clearwater
PROJECT NUMBER: 5110
PROJECT MANAGER:
COMPANY NAME: See page 1 of 3
ADDRESS:
CITY/STATE/ZIP:
E-MAIL ADDRESS:
PHONE #: FAX #:
SAMPLER'S SIGNATURE:

Analysis columns: NUMBER OF CONTAINERS; Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐ SIM PAH☐; Volatile Organics 624☐ 8260☐ 8021☐ BTEX☐; Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐; Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐; PCBs Aroclors☐ Congeners☐; Pesticides/Herbicides 608☐ 8081☐ 8141☐ 8151☐; Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐; Metals, Total or Dissolved (See List below); Cyanide☐ Hex-Chrom☐; (circle) pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS, Turb.; (circle) NH_3-N, COD, TKN, TOC, DOC, NO_2+NO_3, T-Phos; TOX 9020☐ AOX 1650☐; Alkalinity☐ CO_3☐ HCO_3☐; Dioxins/Furans 1613☐ 8290☐ 506☐; Dissolved Gases RSK 175☐ Methane☐ Ethane☐ Ethene☐ CO_2☐; EPA 308 - MeOH

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	EPA 308 - MeOH	REMARKS
MtD No2 Pt 2B-R2	4/12/14	NA	31	Aqu	1	✓	sample label says 4/11/14
" -R2	↓	↓	32, 33	tube	1	✓	↓
" -R3	↓	↓	34	Aqu	1	✓	↓
" -R3	↓	↓	35, 36	tube	1	✓	↓
Blank H_2O	4/14/14	↓	37	Aqu	1	✓	
Blank tube	↓	↓	38, 39	tube	1	✓	

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required

X II. Report Dup., MS, MSD as required

___ III. CLP Like Summary (no raw data)

___ IV. Data Validation Report

___ V. EDD

INVOICE INFORMATION

P.O. # 5110

Bill To: E Bagwell

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.

___ 5 day

X Standard (15 working days)

___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: ______ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

See page 1 of 3

☐ Sample Shipment contains USDA regulated soil samples (check box if applicable)

RELINQUISHED BY:		RECEIVED BY:		RELINQUISHED BY:		RECEIVED BY:	
Signature: [signature]	Date/Time: 4/15/14 8:50	Signature: [signature]	Date/Time: 4/15/14 850	Signature	Date/Time	Signature: [signature]	Date/Time: 4/15/14 1130
Printed Name: [illegible]	Firm	Printed Name: [illegible]	Firm: ALS	Printed Name	Firm	Printed Name: Holly Steele	Firm: ALS

HORIZON ENGINEERING 14-5110

PC Shaw

Cooler Receipt and Preservation Form

Client / Project: Clearwater Paper Corp Service Request *K14* 03122

Received: 4/15/14 Opened: 4/15/14 By: HS Unloaded: 4/15/14 By: HS

1. Samples were received via? *Mail* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* _____ *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? _____
   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected. Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number (NA)	Filed
1.4	1.2	—	—	-.2	341			
							-	

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA Y N
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA Y N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
12. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time
M+D No1 pt No 1A R3	1 VOA		X							
M+D No.1 pt No 2A R1	1 VOA		X							
" " " R2	1 VOA		X							
" " " R3	1 VOA		X							
M+D No2 pt No 2B R1	1 VOA		X							
M+D No2 pt No 1B R2	1 VOA		X							

Notes, Discrepancies, & Resolutions: _____

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/08/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No1 Pt 1A-R1	**Units:**	ug
Lab Code:	K1403722-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**19000**	D	2200	100	04/18/14	04/21/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/08/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No1 Pt 1A-R2	**Units:**	ug
Lab Code:	K1403722-004	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**20000**	D	2200	100	04/18/14	04/21/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/08/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No1 Pt 1A-R3	**Units:**	ug
Lab Code:	K1403722-007	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**20000**	D	2200	100	04/18/14	04/21/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/09/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No1 Pt 2A-R1	**Units:**	ug
Lab Code:	K1403722-010	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**23000**	D	2200	100	04/18/14	04/21/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/09/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No1 Pt 2A-R2	**Units:**	ug
Lab Code:	K1403722-013	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**23000**	D	2200	100	04/18/14	04/21/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/09/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No1 Pt 2A-R3	**Units:**	ug
Lab Code:	K1403722-016	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**20000**	D	2200	100	04/18/14	04/21/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/10/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No2 Pt 1B-R1	**Units:**	ug
Lab Code:	K1403722-019	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**30000**	D	2200	100	04/18/14	04/18/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/10/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No2 Pt 1B-R2	**Units:**	ug
Lab Code:	K1403722-022	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**25000**	D	2200	100	04/18/14	04/18/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/10/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No2 Pt 1B-R3	**Units:**	ug
Lab Code:	K1403722-025	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**30000**	D	2200	100	04/18/14	04/18/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/11/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No2 Pt 2B-R1	**Units:**	ug
Lab Code:	K1403722-028	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**25000**	D	2200	100	04/18/14	04/18/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/12/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No2 Pt 2B-R2	**Units:**	ug
Lab Code:	K1403722-031	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**34000**	D	2200	100	04/18/14	04/18/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/12/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	M+D No2 Pt 2B-R3	**Units:**	ug
Lab Code:	K1403722-034	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**35000**	D	2200	100	04/18/14	04/18/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/14/2014
Sample Matrix:	Water	**Date Received:**	04/15/2014

Methanol Impingers

Sample Name:	Blank H2O	**Units:**	ug
Lab Code:	K1403722-037	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	ND	U	22	1	04/18/14	04/18/14	KWG1403471	

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Methanol Impingers

Sample Name:	Method Blank	**Units:**	ug
Lab Code:	KWG1403471-4	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	ND	U	0.50	1	04/18/14	04/18/14	KWG1403471	

Comments:

QA/QC Report

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Extracted:**	04/18/2014
Sample Matrix:	Water	**Date Analyzed:**	04/18/2014

Matrix Spike Summary
Methanol Impingers

Sample Name:	M+D No2 Pt 1B-R1	**Units:**	ug
Lab Code:	K1403722-019	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308	**Extraction Lot:**	KWG1403471

M+D No2 Pt 1B-R1MS
KWG1403471-1
Matrix Spike

Analyte Name	Sample Result	Result	Spike Amount	%Rec	%Rec Limits
Methanol	30000	256000	220000	103	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

QA/QC Report

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Extracted:**	04/18/2014
Sample Matrix:	Water	**Date Analyzed:**	04/18/2014

Duplicate Sample Summary
Methanol Impingers

Sample Name:	M+D No2 Pt 1B-R1	**Units:**	ug
Lab Code:	K1403722-019	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308	**Extraction Lot:**	KWG1403471

			M+D No2 Pt 1B-R1DUP KWG1403471-2 Duplicate Sample			
Analyte Name	**MRL**	**Sample Result**	**Result**	**Average**	**Relative Percent Difference**	**RPD Limit**
Methanol	2200	30000	29000	29000	3	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

QA/QC Report

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Extracted:**	04/18/2014
Sample Matrix:	Water	**Date Analyzed:**	04/18/2014

Lab Control Spike Summary
Methanol Impingers

Extraction Method:	METHOD	**Units:**	ug
Analysis Method:	308	**Basis:**	NA
		Level:	Low
		Extraction Lot:	KWG1403471

	Lab Control Sample KWG1403471-3 Lab Control Spike			
Analyte Name	**Result**	**Spike Amount**	**%Rec**	**%Rec Limits**
Methanol	51.9	50.0	104	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/08/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 1A-R1 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-002	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**580**	D	150	100	04/21/14	04/21/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	106	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/08/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 1A-R1 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-003	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**440**	D	150	100	04/21/14	04/21/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	117	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/08/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 1A-R2 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-005	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**840**	D	150	100	04/21/14	04/21/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	101	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/08/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 1A-R2 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-006	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**630**	D	150	100	04/21/14	04/21/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	121	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/08/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 1A-R3 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-008	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1700**	D	150	100	04/21/14	04/21/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	115	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/08/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 1A-R3 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-009	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1100**	D	150	100	04/21/14	04/21/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	108	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/09/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 2A-R1 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-011	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1100**	D	150	100	04/21/14	04/21/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	111	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/09/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 2A-R1 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-012	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**840**	D	150	100	04/21/14	04/21/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	110	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/09/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 2A-R2 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-014	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1100**	D	150	100	04/21/14	04/21/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	103	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/09/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 2A-R2 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-015	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**800**	D	150	100	04/21/14	04/22/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	107	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/09/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 2A-R3 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-017	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**940**	D	150	100	04/21/14	04/22/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	111	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/09/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No1 Pt 2A-R3 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-018	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**750**	D	150	100	04/21/14	04/22/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	109	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/10/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 1B-R1 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-020	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**730**	D	150	100	04/21/14	04/22/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	110	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/10/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 1B-R1 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-021	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**610**	D	150	100	04/21/14	04/22/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	109	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/10/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 1B-R2 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-023	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1400**	D	150	100	04/21/14	04/22/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	114	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/10/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 1B-R2 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-024	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**940**	D	150	100	04/21/14	04/22/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	108	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/10/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 1B-R3 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-026	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1800**	D	150	100	04/21/14	04/22/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	113	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/10/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 1B-R3 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-027	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1300**	D	150	100	04/21/14	04/22/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	110	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/11/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 2B-R1 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-029	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**2100**	D	150	100	04/21/14	04/22/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	115	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/11/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 2B-R1 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-030	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1500**	D	150	100	04/21/14	04/22/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	110	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/12/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 2B-R2 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-032	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1100**	D	150	100	04/21/14	04/22/14	KWG1403520	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	110	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/12/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 2B-R2 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-033	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**790**	D	150	100	04/21/14	04/22/14	KWG1403520	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	113	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/12/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 2B-R3 Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-035	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1700**	D	150	100	04/21/14	04/22/14	KWG1403520	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	117	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/12/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	M+D No2 Pt 2B-R3 Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-036	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1300**	D	150	100	04/21/14	04/22/14	KWG1403520	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	114	50-150	04/22/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/14/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	Blank Silica Gel Tube - Front	**Units:**	ug
Lab Code:	K1403722-038	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	**1.7**		1.5	1	04/21/14	04/21/14	KWG1403520	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	108	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	04/14/2014
Sample Matrix:	Misc. solid	**Date Received:**	04/15/2014

Methanol Silica-gel Tubes

Sample Name:	Blank Silica Gel Tube - Back	**Units:**	ug
Lab Code:	K1403722-039	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	ND	U	1.5	1	04/21/14	04/21/14	KWG1403520	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	107	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	NA
Sample Matrix:	Misc. solid	**Date Received:**	NA

Methanol Silica-gel Tubes

Sample Name:	Method Blank	**Units:**	ug
Lab Code:	KWG1403518-3	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	ND	U	1.5	1	04/21/14	04/21/14	KWG1403518	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	107	50-150	04/21/14	Acceptable

Comments:

Analytical Results

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Collected:**	NA
Sample Matrix:	Misc. solid	**Date Received:**	NA

Methanol Silica-gel Tubes

Sample Name:	Method Blank	**Units:**	ug
Lab Code:	KWG1403520-3	**Basis:**	Wet
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	308		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Methanol	ND	U	1.5	1	04/21/14	04/21/14	KWG1403520	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Ethanol	101	50-150	04/21/14	Acceptable

Comments:

QA/QC Report

Client: Horizon Engineering, LLC **Service Request:** K1403722
Project: Clearwater Paper Corp./5110
Sample Matrix: Misc. solid

Surrogate Recovery Summary
Methanol Silica-gel Tubes

Extraction Method: METHOD **Units:** Percent
Analysis Method: 308 **Level:** Low

Sample Name	Lab Code	Sur1
M+D No1 Pt 1A-R1 Silica Gel Tube -	K1403722-002	106 D
M+D No1 Pt 1A-R1 Silica Gel Tube -	K1403722-003	117 D
M+D No1 Pt 1A-R2 Silica Gel Tube -	K1403722-005	101 D
M+D No1 Pt 1A-R2 Silica Gel Tube -	K1403722-006	121 D
M+D No1 Pt 1A-R3 Silica Gel Tube -	K1403722-008	115 D
M+D No1 Pt 1A-R3 Silica Gel Tube -	K1403722-009	108 D
M+D No1 Pt 2A-R1 Silica Gel Tube -	K1403722-011	111 D
M+D No1 Pt 2A-R1 Silica Gel Tube -	K1403722-012	110 D
M+D No1 Pt 2A-R2 Silica Gel Tube -	K1403722-014	103 D
M+D No1 Pt 2A-R2 Silica Gel Tube -	K1403722-015	107 D
M+D No1 Pt 2A-R3 Silica Gel Tube -	K1403722-017	111 D
M+D No1 Pt 2A-R3 Silica Gel Tube -	K1403722-018	109 D
M+D No2 Pt 1B-R1 Silica Gel Tube -	K1403722-020	110 D
M+D No2 Pt 1B-R1 Silica Gel Tube -	K1403722-021	109 D
M+D No2 Pt 1B-R2 Silica Gel Tube -	K1403722-023	114 D
M+D No2 Pt 1B-R2 Silica Gel Tube -	K1403722-024	108 D
M+D No2 Pt 1B-R3 Silica Gel Tube -	K1403722-026	113 D
M+D No2 Pt 1B-R3 Silica Gel Tube -	K1403722-027	110 D
M+D No2 Pt 2B-R1 Silica Gel Tube -	K1403722-029	115 D
M+D No2 Pt 2B-R1 Silica Gel Tube -	K1403722-030	110 D
M+D No2 Pt 2B-R2 Silica Gel Tube -	K1403722-032	110 D
M+D No2 Pt 2B-R2 Silica Gel Tube -	K1403722-033	113 D
M+D No2 Pt 2B-R3 Silica Gel Tube -	K1403722-035	117 D
M+D No2 Pt 2B-R3 Silica Gel Tube -	K1403722-036	114 D
Blank Silica Gel Tube - Front	K1403722-038	108
Blank Silica Gel Tube - Back	K1403722-039	107
Method Blank	KWG1403518-3	107
Method Blank	KWG1403520-3	101
Lab Control Sample	KWG1403518-1	108
Duplicate Lab Control Sample	KWG1403518-2	107
Lab Control Sample	KWG1403520-1	108
Duplicate Lab Control Sample	KWG1403520-2	108

Surrogate Recovery Control Limits (%)

Sur1	= Ethanol	50-150

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

QA/QC Report

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Extracted:**	04/21/2014
Sample Matrix:	Misc. solid	**Date Analyzed:**	04/21/2014

Lab Control Spike/Duplicate Lab Control Spike Summary
Methanol Silica-gel Tubes

Extraction Method:	METHOD	**Units:**	ug
Analysis Method:	308	**Basis:**	Wet
		Level:	Low
		Extraction Lot:	KWG1403518

	Lab Control Sample KWG1403518-1 Lab Control Spike			Duplicate Lab Control Sample KWG1403518-2 Duplicate Lab Control Spike					
Analyte Name	**Result**	**Spike Amount**	**%Rec**	**Result**	**Spike Amount**	**%Rec**	**%Rec Limits**	**RPD**	**RPD Limit**
Methanol	166	150	111	159	150	106	50-150	4	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

QA/QC Report

Client:	Horizon Engineering, LLC	**Service Request:**	K1403722
Project:	Clearwater Paper Corp./5110	**Date Extracted:**	04/21/2014
Sample Matrix:	Misc. solid	**Date Analyzed:**	04/21/2014

Lab Control Spike/Duplicate Lab Control Spike Summary
Methanol Silica-gel Tubes

Extraction Method:	METHOD	**Units:**	ug
Analysis Method:	308	**Basis:**	Wet
		Level:	Low
		Extraction Lot:	KWG1403520

	Lab Control Sample KWG1403520-1 Lab Control Spike			Duplicate Lab Control Sample KWG1403520-2 Duplicate Lab Control Spike					
Analyte Name	**Result**	**Spike Amount**	**%Rec**	**Result**	**Spike Amount**	**%Rec**	**%Rec Limits**	**RPD**	**RPD Limit**
Methanol	164	150	110	162	150	108	50-150	1	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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LABORATORY REPORT

April 25, 2014

Margery Heffernan
Horizon Engineering, LLC
13585 NE Whitaker Way
Portland, OR 97230

RE: Clearwater Paper Corp. / 5110

Dear Margery:

Enclosed are the results of the samples submitted to our laboratory on April 14, 2014. For your reference, these analyses have been assigned our service request number P1401510.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Sue Anderson at 8:54 am, Apr 25, 2014

For Kelly Horiuchi
Laboratory Director

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Client: Horizon Engineering, LLC
Project: Clearwater Paper Corp. / 5110

Service Request No: P1401510

CASE NARRATIVE

The samples were received intact under chain of custody on April 14, 2014 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Sulfur Analysis

The samples were analyzed for selected sulfur compounds per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

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ALS Environmental – Simi Valley

Certifications, Accreditations, and Registrations

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2012039
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	643428
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-13-4
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272013-3
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Horizon Engineering, LLC
Project ID: Clearwater Paper Corp. / 5110
Service Request: P1401510

Date Received: 4/14/2014
Time Received: 10:40

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	ASTM D5504-08 - Sulfur Can
M&D No. 1, Sample Pt 1A - Run 1	P1401510-001	Air	4/8/2014	14:03	SSC00224	-1.65	3.58	X
M&D No. 1, Sample Pt 1A - Run 2	P1401510-002	Air	4/8/2014	15:18	SSC00231	-1.90	3.71	X
M&D No. 1, Sample Pt 1A - Run 3	P1401510-003	Air	4/8/2014	16:38	SSC00228	-1.76	3.60	X

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CHAIN of CUSTODY

Page _1__ of __1_

Client:	Horizon Engineering
	13585 NE Whitakery Way
	Portland OR 97230
Project Manager	Joe Heffernan III
Project:	Clearwater Paper Corportation / 5110
Telephone No.	503-255-5050
Fax No.	503-255-0505

Method of Shipment: ground

Special Detection Limit/Reporting: analyze for hydrogen sulfide, methyl mercaptan, dimethyl sulfide and dimethyl disulfide

Sample I.D.	Lab Sample No.	No. of Containers	Matrix: Soil	Water	Air	Other	Prsv.: Yes	No	Sampling Date	Sampling Time	ASTM D5504-08 - 4 TRS compds													Turn Around Time (working days)
M&D No. 1, Sample Pt 1A - Run 1	SSL00224	1			x			x	4/6/14	1403	x				-1.54									std
M&D No. 1, Sample Pt 1A - Run 2	SSL00231	1			x			x		1513	x				-1.55									std
M&D No. 1, Sample Pt 1A - Run 3	SSL00228	1			x			x		1633	x				-1.75									std
Blown Run Analysis	SSL00003	1			NA			NA			NA				-3.50									
3 flow controllers	SOA00144																							
	SOA00146																							
	SOA00099																							
4 Analog pressure gauges																								

*do not analyze

MARKS

Sample Received Intact: Yes No

Temperature received: Ice No ice

Relinq. by sampler (Sign & Print Name)	Date / Time	Received by (Sign & Print Name)	
Joe Heffernan	4/9/14 1934	Craig Masters	4-5-14 0934
Relinquished by: Craig Masters	Date / Time: 4-5-14 10:00	Received by: UW Express	
Relinquished by: UW Express	Date / Time: 4/14/14 1040	Received by:	
Relinquished by	Date / Time	Received by laboratory	Date / Time

Lab Work No. 9HD1570

HORIZON ENGINEERING 14-5110

ALS Environmental
Sample Acceptance Check Form

Client: Horizon Engineering, LLC Work order: P1401510

Project: Clearwater Paper Corp. / 5110

Sample(s) received on: 4/14/14 Date opened: 4/14/14 by: MZAMORA

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by ALS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
5	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
6	Was **sample volume** received adequate for analysis?	☒	☐	☐
7	Are samples within specified holding times?	☒	☐	☐
8	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
9	Was a **trip blank** received?	☐	☒	☐
10	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
11	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
12	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
13	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1401510-001.01	6.0 L Silonite Can					
P1401510-002.01	6.0 L Silonite Can					
P1401510-003.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 1, Sample Pt 1A - Run 1**
Client Project ID: **Clearwater Paper Corp. / 5110**

ALS Project ID: P1401510
ALS Sample ID: P1401510-001

Test Code:	ASTM D 5504-08	Date Collected:	4/8/14
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	14:03
Analyst:	Mike Conejo	Date Received:	4/14/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/15/14
Test Notes:		Time Analyzed:	12:25
Container ID:	SSC00224	Volume(s) Analyzed:	0.0070 ml(s)

Initial Pressure (psig): -1.65 Final Pressure (psig): 3.58

Canister Dilution Factor: 1.40

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**13,000**	1,400	**9,300**	1,000	
74-93-1	Methyl Mercaptan	**1,800,000**	2,000	**890,000**	1,000	
75-18-3	Dimethyl Sulfide	**12,000,000**	2,500	**4,900,000**	1,000	
624-92-0	Dimethyl Disulfide	**220,000**	1,900	**56,000**	500	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 1, Sample Pt 1A - Run 2**
Client Project ID: **Clearwater Paper Corp. / 5110**

ALS Project ID: P1401510
ALS Sample ID: P1401510-002

Test Code:	ASTM D 5504-08	Date Collected:	4/8/14
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	15:18
Analyst:	Mike Conejo	Date Received:	4/14/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/15/14
Test Notes:		Time Analyzed:	12:40
Container ID:	SSC00231	Volume(s) Analyzed:	0.0070 ml(s)

Initial Pressure (psig): -1.90 Final Pressure (psig): 3.71

Canister Dilution Factor: 1.44

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**8,400**	1,400	**6,100**	1,000	
74-93-1	Methyl Mercaptan	**1,300,000**	2,000	**680,000**	1,000	
75-18-3	Dimethyl Sulfide	**8,000,000**	2,600	**3,100,000**	1,000	
624-92-0	Dimethyl Disulfide	**170,000**	2,000	**43,000**	510	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 1, Sample Pt 1A - Run 3**
Client Project ID: **Clearwater Paper Corp. / 5110**

ALS Project ID: P1401510
ALS Sample ID: P1401510-003

Test Code:	ASTM D 5504-08	Date Collected:	4/8/14
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	16:38
Analyst:	Mike Conejo	Date Received:	4/14/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/15/14
Test Notes:		Time Analyzed:	13:33
Container ID:	SSC00228	Volume(s) Analyzed:	0.0070 ml(s)

Initial Pressure (psig): -1.76 Final Pressure (psig): 3.60

Canister Dilution Factor: 1.41

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**17,000**	1,400	**12,000**	1,000	
74-93-1	Methyl Mercaptan	**1,900,000**	2,000	**950,000**	1,000	
75-18-3	Dimethyl Sulfide	**11,000,000**	2,600	**4,400,000**	1,000	
624-92-0	Dimethyl Disulfide	**260,000**	1,900	**66,000**	500	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Horizon Engineering, LLC**
Client Sample ID: **Method Blank**
Client Project ID: **Clearwater Paper Corp. / 5110**

ALS Project ID: P1401510
ALS Sample ID: P140415-MB

Test Code: ASTM D 5504-08
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Time Collected: NA
Date Received: NA
Date Analyzed: 4/15/14
Time Analyzed: 07:45
Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **Horizon Engineering, LLC**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1401510
Client Project ID: **Clearwater Paper Corp. / 5110** ALS Sample ID: P140415-LCS

Test Code: ASTM D 5504-08 Date Collected: NA
Instrument ID: Agilent 6890A/GC13/SCD Date Received: NA
Analyst: Mike Conejo Date Analyzed: 4/15/14
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: NA ml(s)
Test Notes:

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	ALS Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	2,050	**2,160**	**105**	66-131	
74-93-1	Methyl Mercaptan	1,890	**2,250**	**119**	68-160	

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LABORATORY REPORT

April 25, 2014

Margery Heffernan
Horizon Engineering, LLC
13585 NE Whitaker Way
Portland, OR 97230

RE: Clearwater Paper Corporation / 5110

Dear Margery:

Enclosed are the results of the samples submitted to our laboratory on April 15, 2014. For your reference, these analyses have been assigned our service request number P1401522.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Kelly Horiuchi at 4:42 pm, Apr 25, 2014

Kelly Horiuchi
Laboratory Director

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Client: Horizon Engineering, LLC
Project: Clearwater Paper Corporation / 5110

Service Request No: P1401522

CASE NARRATIVE

The samples were received intact under chain of custody on April 15, 2014 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Sulfur Analysis

The samples were analyzed for four sulfur compounds per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

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Certifications, Accreditations, and Registrations

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2012039
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	643428
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-13-4
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272013-3
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Horizon Engineering, LLC Service Request: P1401522
Project ID: Clearwater Paper Corporation / 5110

Date Received: 4/15/2014
Time Received: 10:15

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	ASTM D5504-08 - Sulfur Can
M&D No. 1, Sample Pt 2A - Run 1	P1401522-001	Air	4/9/2014	13:40	SSC00213	-1.04	3.67	X
M&D No. 1, Sample Pt 2A - Run 2	P1401522-002	Air	4/9/2014	14:47	SSC00092	-0.47	3.57	X
M&D No. 1, Sample Pt 2A - Run 3	P1401522-003	Air	4/9/2014	15:55	SSC00229	-1.49	3.54	X

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CHAIN of CUSTODY

Page _1__ of __1_

Client:	Horizon Engineering	Project:	Clearwater Paper Corporation / 5110
	13585 NE Whitakery Way Portland OR 97230	Method of Shipment	ground
Project Manager	Joe Heffernan III	Telephone No. 503-255-5050	Fax No. 503-255-0505

Special Detection Limit/Reporting: analyze for hydrogen sulfide, methyl mercaptan, dimethyl sulfide and dimethyl disulfide

Sample I.D.	Lab Sample No.	No. of Containers	Matrix: Soil	Water	Air	Other	Prsv.: Yes	No	Sampling Date	Sampling Time	ASTM D5504-08 - 4 TRS compds													Turn Around Time (working days)
(3) M&D No. 1, Sample Pt 2A - Run 1	SSC00213	1			x			x	4/9/14	1740	x				-0.93									std
(2) M&D No. 1, Sample Pt 2A - Run 2	SSC00214	1			x			x	"	1447	x				-0.27									std
(1) M&D No. 1, Sample Pt 2A - Run 3	SSC00215	1			x			x	"	1555	x				-1.32									std
Flow conditions																								
	SOA00056																							
	SOA00141																							
	SOA00315																							
Analog pressure gauges		4																						

MARKS

Sample Received Intact: Yes No

Temperature received: Ice No ice

Relinq by sampler (Sign & Print Name)	Date	Time	Received by (Sign & Print Name)	Date	Time
Joe Heffernan III	4/10/14	0524	Ron Landers	4-10-14	08:25
Relinquished by: Ron Landers	Date: 4-10-14	Time: 08:40	Received by: C Asbury	4-10-14	08:41
Relinquished by: C Asbury	Date: 4/10/14	Time: 11:00	Received by:	4/10/14	1015
Relinquished by	Date	Time	Received by laboratory	Date	Time

Lab Work No. P1401522

HORIZON ENGINEERING 14-5110

ALS Environmental
Sample Acceptance Check Form

Client: Horizon Engineering, LLC Work order: P1401522

Project: Clearwater Paper Corporation / 5110

Sample(s) received on: 4/15/14 Date opened: 4/15/14 by: MZAMORA

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by ALS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
5	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
6	Was **sample volume** received adequate for analysis?	☒	☐	☐
7	Are samples within specified holding times?	☒	☐	☐
8	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
9	Was a **trip blank** received?	☐	☒	☐
10	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
11	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
12	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
13	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1401522-001.01	6.0 L Silonite Can					
P1401522-002.01	6.0 L Silonite Can					
P1401522-003.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 1, Sample Pt 2A - Run 1**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401522
ALS Sample ID: P1401522-001

Test Code:	ASTM D 5504-08	Date Collected:	4/9/14
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	13:40
Analyst:	Mike Conejo	Date Received:	4/15/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/16/14
Test Notes:		Time Analyzed:	10:55
Container ID:	SSC00213	Volume(s) Analyzed:	0.0050 ml(s)

Initial Pressure (psig): -1.04 Final Pressure (psig): 3.67

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**20,000**	1,900	**14,000**	1,300	
74-93-1	Methyl Mercaptan	**3,400,000**	2,600	**1,700,000**	1,300	
75-18-3	Dimethyl Sulfide	**24,000,000**	3,400	**9,300,000**	1,300	
624-92-0	Dimethyl Disulfide	**310,000**	2,600	**82,000**	670	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 1, Sample Pt 2A - Run 2**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401522
ALS Sample ID: P1401522-002

Test Code:	ASTM D 5504-08	Date Collected:	4/9/14
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	14:47
Analyst:	Mike Conejo	Date Received:	4/15/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/16/14
Test Notes:		Time Analyzed:	14:58
Container ID:	SSC00092	Volume(s) Analyzed:	0.0050 ml(s)

Initial Pressure (psig): -0.47 Final Pressure (psig): 3.57

Canister Dilution Factor: 1.28

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	1,800	ND	1,300	
74-93-1	Methyl Mercaptan	**2,900,000**	2,500	**1,500,000**	1,300	
75-18-3	Dimethyl Sulfide	**21,000,000**	3,300	**8,100,000**	1,300	
624-92-0	Dimethyl Disulfide	**430,000**	2,500	**110,000**	640	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 1, Sample Pt 2A - Run 3**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401522
ALS Sample ID: P1401522-003

Test Code:	ASTM D 5504-08	Date Collected:	4/9/14
Instrument ID:	Agilent 6890A/GC13/SCD	Time Collected:	15:55
Analyst:	Mike Conejo	Date Received:	4/15/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/16/14
Test Notes:		Time Analyzed:	12:03
Container ID:	SSC00229	Volume(s) Analyzed:	0.0050 ml(s)

Initial Pressure (psig): -1.49 Final Pressure (psig): 3.54

Canister Dilution Factor: 1.38

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**18,000**	1,900	**13,000**	1,400	
74-93-1	Methyl Mercaptan	**3,100,000**	2,700	**1,600,000**	1,400	
75-18-3	Dimethyl Sulfide	**21,000,000**	3,500	**8,400,000**	1,400	
624-92-0	Dimethyl Disulfide	**260,000**	2,700	**66,000**	690	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

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Client: **Horizon Engineering, LLC**
Client Sample ID: **Method Blank**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401522
ALS Sample ID: P140416-MB

Test Code: ASTM D 5504-08
Instrument ID: Agilent 6890A/GC13/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Time Collected: NA
Date Received: NA
Date Analyzed: 4/16/14
Time Analyzed: 08:28
Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **Horizon Engineering, LLC**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1401522
Client Project ID: **Clearwater Paper Corporation / 5110** ALS Sample ID: P140416-LCS

Test Code: ASTM D 5504-08 Date Collected: NA
Instrument ID: Agilent 6890A/GC13/SCD Date Received: NA
Analyst: Mike Conejo Date Analyzed: 4/16/14
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: NA ml(s)
Test Notes:

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	ALS Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	2,050	**1,600**	**78**	66-131	
74-93-1	Methyl Mercaptan	1,890	**1,660**	**88**	68-160	

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LABORATORY REPORT

April 29, 2014

Margery Heffernan
Horizon Engineering, LLC
13585 NE Whitaker Way
Portland, OR 97230

RE: Clearwater Paper Corporation / 5110

Dear Margery:

Enclosed are the results of the samples submitted to our laboratory on April 17, 2014. For your reference, these analyses have been assigned our service request number P1401585.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Kelly Horiuchi at 8:40 am, Apr 30, 2014

Kelly Horiuchi
Laboratory Director

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Simi Valley, CA 93065
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www.alsglobal.com

Client: Horizon Engineering, LLC
Project: Clearwater Paper Corporation / 5110

Service Request No: P1401585

CASE NARRATIVE

The samples were received intact under chain of custody on April 17, 2014 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Sulfur Analysis

The samples were analyzed for four sulfur compounds per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

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ALS Environmental – Simi Valley

Certifications, Accreditations, and Registrations

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2012039
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	643428
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-13-4
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272013-3
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Horizon Engineering, LLC Service Request: P1401585
Project ID: Clearwater Paper Corporation / 5110

Date Received: 4/17/2014
Time Received: 13:05

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	ASTM D5504-08 - Sulfur Can
M&D No. 2, Sample Pt 1B - Run 1	P1401585-001	Air	4/10/2014	12:46	SSC00212	-1.61	1.86	X
M&D No. 2, Sample Pt 1B - Run 2	P1401585-002	Air	4/10/2014	13:53	SSC00014	-1.66	1.78	X
M&D No. 2, Sample Pt 1B - Run 3	P1401585-003	Air	4/10/2014	15:00	SSC00153	-1.55	1.64	X
Clean Blank	P1401585-004	Air	4/10/2014	12:00	SSC00217	-0.02	1.18	X

CHAIN of CUSTODY

Page _1_ of _1_

Columbia Analytical Services
800.695.7222
www.caslab.com

Client:	Horizon Engineering
	13585 NE Whitakery Way
	Portland OR 97230
Project Manager	Joe Heffernan III
Project:	Clearwater Paper Corportation / 5110
Telephone No.	503-255-5050
Fax No.	503-255-0505

Method of Shipment: ground

Special Detection Limit/Reporting: analyze for hydrogen sulfide, methyl mercaptan, dimethyl sulfide and dimethyl disulfide

Sample I.D.	Lab Sample No.	No. of Containers	Matrix: Soil	Water	Air	Other	Prsv.: Yes	No	Sampling Date	Sampling Time	ASTM D5504-08 - 4 TRS compds	Turn Around Time (working days)
M&D No. 2, Sample Pt 1B - Run 1	SSC00212	1			x			x	4/10/14	1246	x	std
M&D No. 2, Sample Pt 1B - Run 2	SSC00214	1			x			x	"	1353	x	std
M&D No. 2, Sample Pt 1B - Run 3	SSC00215 (153)	1			x			x	"	1500	x	std
Clean Blank	SSC00217	1			X			X	"	1200	X	Std
Flow controllers	50A00052											
	50A00031											
	50A00160											
Analog Pressure gauges												

MARKS

Sample Received Intact: Yes No

Temperature received: Ice No ice

	Date	Time		Lab Work No.
Relinq by sampler (Sign & Print Name) Joe Heffernan III	4/11/14	1042	Received by (Sign & Print Name) Rick Wilkinson	4/11/14 10:42
Relinquished by Rick Wilkinson Rick Wilkinson	4/11/14	1100	Received by Carole Asbury CAROLE ASBURY	4/11/14 11
Relinquished by Carole Asbury CAROLE ASBURY	4/11/14	11:30	Received by	
Relinquished by	Date	Time	Received by laboratory	Date 4/17/14 Time 1305

HORIZON ENGINEERING 14-5110

184

ALS Environmental
Sample Acceptance Check Form

Client: Horizon Engineering, LLC Work order: P1401585

Project: Clearwater Paper Corporation / 5110

Sample(s) received on: 4/17/14 Date opened: 4/17/14 by: RMARTENIES

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by ALS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
5	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
6	Was **sample volume** received adequate for analysis?	☒	☐	☐
7	Are samples within specified holding times?	☒	☐	☐
8	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
9	Was a **trip blank** received?	☐	☒	☐
10	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
11	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
12	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
13	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1401585-001.01	6.0 L Silonite Can					
P1401585-002.01	6.0 L Silonite Can					
P1401585-003.01	6.0 L Silonite Can					
P1401585-004.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 2, Sample Pt 1B - Run 1**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401585
ALS Sample ID: P1401585-001

Test Code:	ASTM D 5504-08	Date Collected:	4/10/14
Instrument ID:	Agilent 7890A/GC22/SCD	Time Collected:	12:46
Analyst:	Mike Conejo	Date Received:	4/17/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/21/14
Test Notes:		Time Analyzed:	14:41
Container ID:	SSC00212	Volume(s) Analyzed:	0.030 ml(s)

Initial Pressure (psig): -1.61 Final Pressure (psig): 1.86

Canister Dilution Factor: 1.27

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**400**	290	**280**	210	
74-93-1	Methyl Mercaptan	**1,200,000**	420	**600,000**	210	
75-18-3	Dimethyl Sulfide	**110,000**	540	**44,000**	210	
624-92-0	Dimethyl Disulfide	**200,000**	410	**53,000**	110	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 2, Sample Pt 1B - Run 2**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401585
ALS Sample ID: P1401585-002

Test Code:	ASTM D 5504-08	Date Collected:	4/10/14
Instrument ID:	Agilent 7890A/GC22/SCD	Time Collected:	13:53
Analyst:	Mike Conejo	Date Received:	4/17/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/21/14
Test Notes:		Time Analyzed:	15:01
Container ID:	SSC00014	Volume(s) Analyzed:	0.030 ml(s)

Initial Pressure (psig): -1.66 Final Pressure (psig): 1.78

Canister Dilution Factor: 1.26

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**2,000**	290	**1,400**	210	
74-93-1	Methyl Mercaptan	**2,700,000**	410	**1,400,000**	210	
75-18-3	Dimethyl Sulfide	**750,000**	530	**290,000**	210	
624-92-0	Dimethyl Disulfide	**480,000**	400	**120,000**	110	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 2, Sample Pt 1B - Run 3**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401585
ALS Sample ID: P1401585-003

Test Code: ASTM D 5504-08
Instrument ID: Agilent 7890A/GC22/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: SSC00153

Date Collected: 4/10/14
Time Collected: 15:00
Date Received: 4/17/14
Date Analyzed: 4/21/14
Time Analyzed: 15:22
Volume(s) Analyzed: 0.030 ml(s)

Initial Pressure (psig): -1.55 Final Pressure (psig): 1.64

Canister Dilution Factor: 1.24

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	290	ND	210	
74-93-1	Methyl Mercaptan	**2,300,000**	410	**1,200,000**	210	
75-18-3	Dimethyl Sulfide	**210,000**	520	**83,000**	210	
624-92-0	Dimethyl Disulfide	**480,000**	400	**120,000**	100	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **Clean Blank** ALS Project ID: P1401585
Client Project ID: **Clearwater Paper Corporation / 5110** ALS Sample ID: P1401585-004

Test Code:	ASTM D 5504-08	Date Collected:	4/10/14
Instrument ID:	Agilent 7890A/GC22/SCD	Time Collected:	12:00
Analyst:	Mike Conejo	Date Received:	4/17/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/21/14
Test Notes:		Time Analyzed:	14:20
Container ID:	SSC00217	Volume(s) Analyzed:	1.0 ml(s)

Initial Pressure (psig): -0.02 Final Pressure (psig): 1.18

Canister Dilution Factor: 1.08

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.5	ND	5.4	
74-93-1	Methyl Mercaptan	**37**	11	**19**	5.4	
75-18-3	Dimethyl Sulfide	**39**	14	**15**	5.4	
624-92-0	Dimethyl Disulfide	**110**	10	**30**	2.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Horizon Engineering, LLC**
Client Sample ID: **Method Blank**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401585
ALS Sample ID: P140421-MB

Test Code: ASTM D 5504-08
Instrument ID: Agilent 7890A/GC22/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Time Collected: NA
Date Received: NA
Date Analyzed: 4/21/14
Time Analyzed: 08:40
Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **Horizon Engineering, LLC**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1401585
Client Project ID: **Clearwater Paper Corporation / 5110** ALS Sample ID: P140421-LCS

Test Code: ASTM D 5504-08 Date Collected: NA
Instrument ID: Agilent 7890A/GC22/SCD Date Received: NA
Analyst: Mike Conejo Date Analyzed: 4/21/14
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: NA ml(s)
Test Notes:

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	ALS Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	2,050	**1,930**	**94**	66-131	
74-93-1	Methyl Mercaptan	1,890	**2,320**	**123**	68-160	

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LABORATORY REPORT

April 30, 2014

Margery Heffernan
Horizon Engineering, LLC
13585 NE Whitaker Way
Portland, OR 97230

RE: Clearwater Paper Corporation / 5110

Dear Margery:

Enclosed are the results of the samples submitted to our laboratory on April 17, 2014. For your reference, these analyses have been assigned our service request number P1401576.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Kelly Horiuchi at 11:28 am, Apr 30, 2014

Kelly Horiuchi
Laboratory Director

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Simi Valley, CA 93065
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Client: Horizon Engineering, LLC
Project: Clearwater Paper Corporation / 5110

Service Request No: P1401576

CASE NARRATIVE

The samples were received intact under chain of custody on April 17, 2014 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Sulfur Analysis

The samples were analyzed for four sulfur compounds per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

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ALS Environmental – Simi Valley

Certifications, Accreditations, and Registrations

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2012039
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	643428
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	CA200007
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-13-4
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA016272013-3
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Horizon Engineering, LLC
Service Request: P1401576
Project ID: Clearwater Paper Corporation / 5110

Date Received: 4/17/2014
Time Received: 13:05

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	ASTM D5504-08 - Sulfur Can
M&D No. 2, Sample Pt 2B - Run 1	P1401576-001	Air	4/12/2014	09:24	SSC00162	-1.76	1.83	X
M&D No. 2, Sample Pt 2B - Run 2	P1401576-002	Air	4/12/2014	10:31	SSC00118	-1.81	2.11	X
M&D No. 2, Sample Pt 2B - Run 3	P1401576-003	Air	4/12/2014	11:35	SSC00088	-1.34	1.91	X
Dirty Blank	P1401576-004	Air	4/12/2014	11:40	SSC00219	-1.11	1.55	X

Columbia Analytical Services
800.695.7222
www.caslab.com

CHAIN of CUSTODY

Page _1__ of __1_

Client: Horizon Engineering 13585 NE Whitakery Way Portland OR 97230		Project: Clearwater Paper Corporation / 5110	Method of Shipment: ground
Project Manager: Joe Heffernan III		Telephone No.: 503-255-5050	Fax No.: 503-255-0505

Special Detection Limit/Reporting: analyze for hydrogen sulfide, methyl mercaptan, dimethyl sulfide and dimethyl disulfide

Sample I.D.	Lab Sample No.	No. of Containers	Matrix: Soil	Water	Air	Other	Prsv.: Yes	No	Sampling Date	Sampling Time	ASTM D5504-08 - 4 TRS compds													Turn Around Time (working days)
M&D No. 2, Sample Pt 2B - Run 1	75C00162	1			x			x	4/12/14	924	x				-1.49									std
M&D No. 2, Sample Pt 2B - Run 2	55C0018	1			x			x		1031	x				-1.53									std
M&D No. 2, Sample Pt 2B - Run 3	55C00088	1			x			x	"	1135	x				-1.07									std
Dirty Blank	55C00219	1			K			X	4/12/14	1140	X				-0.89									std
Flow Controllers	50A00093																							
	50A00098																							
	50A00054																							

MARKS

Sample Received Intact: Yes No

Temperature received: Ice No ice

Relinq. by sampler (Sign & Print Name): Joe Heffernan III	Date: 4/12/14 Time: 1312	Received by (Sign & Print Name): Rick Williams Rick Wilkinson	4/12/14 13:13
Relinquished by: Craig Masters	Date: 4-14-14 Time: 0845	Received by:	4/14/14 900
Relinquished by: 10:30 4/14/14	Date: 4/14/14 Time: 1305	Received by:	
Relinquished by:	Date: Time:	Received by laboratory:	Date: Time:

Lab Work No.: P1402576

HORIZON ENGINEERING 14-5110

196

ALS Environmental
Sample Acceptance Check Form

Client: Horizon Engineering, LLC Work order: P1401576

Project: Clearwater Paper Corporation / 5110

Sample(s) received on: 4/17/14 Date opened: 4/17/14 by: MZAMORA

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Container(s) **supplied by ALS**?	☒	☐	☐
3	Did **sample containers** arrive in good condition?	☒	☐	☐
4	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
5	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
6	Was **sample volume** received adequate for analysis?	☒	☐	☐
7	Are samples within specified holding times?	☒	☐	☐
8	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
9	Was a **trip blank** received?	☐	☒	☐
10	Were **custody seals** on outside of cooler/Box?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
	Were custody seals on outside of sample container?	☐	☒	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
11	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
12	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
	Do they contain moisture?	☐	☐	☒
13	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1401576-001.01	6.0 L Silonite Can					
P1401576-002.01	6.0 L Silonite Can					
P1401576-003.01	6.0 L Silonite Can					
P1401576-004.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 2, Sample Pt 2B - Run 1**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401576
ALS Sample ID: P1401576-001

Test Code:	ASTM D 5504-08	Date Collected:	4/12/14
Instrument ID:	Agilent 7890A/GC22/SCD	Time Collected:	09:24
Analyst:	Mike Conejo	Date Received:	4/17/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/21/14
Test Notes:		Time Analyzed:	09:58, 10:14
Container ID:	SSC00162	Volume(s) Analyzed:	0.10 ml(s)
			0.030 ml(s)

Initial Pressure (psig): -1.76 Final Pressure (psig): 1.83

Canister Dilution Factor: 1.28

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**11,000**	89	**8,200**	64	
74-93-1	Methyl Mercaptan	**2,500,000**	420	**1,300,000**	210	**D**
75-18-3	Dimethyl Sulfide	**440,000**	160	**170,000**	64	
624-92-0	Dimethyl Disulfide	**280,000**	120	**72,000**	32	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
D = The reported result is from a dilution.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 2, Sample Pt 2B - Run 2**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401576
ALS Sample ID: P1401576-002

Test Code:	ASTM D 5504-08	Date Collected:	4/12/14
Instrument ID:	Agilent 7890A/GC22/SCD	Time Collected:	10:31
Analyst:	Mike Conejo	Date Received:	4/17/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/21/14
Test Notes:		Time Analyzed:	12:14
Container ID:	SSC00118	Volume(s) Analyzed:	0.030 ml(s)

Initial Pressure (psig): -1.81 Final Pressure (psig): 2.11

Canister Dilution Factor: 1.30

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	300	ND	220	
74-93-1	Methyl Mercaptan	**1,700,000**	430	**870,000**	220	
75-18-3	Dimethyl Sulfide	**280,000**	550	**110,000**	220	
624-92-0	Dimethyl Disulfide	**240,000**	420	**63,000**	110	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Horizon Engineering, LLC**
Client Sample ID: **M&D No. 2, Sample Pt 2B - Run 3**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401576
ALS Sample ID: P1401576-003

Test Code:	ASTM D 5504-08	Date Collected:	4/12/14
Instrument ID:	Agilent 7890A/GC22/SCD	Time Collected:	11:35
Analyst:	Mike Conejo	Date Received:	4/17/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/21/14
Test Notes:		Time Analyzed:	11:38
Container ID:	SSC00088	Volume(s) Analyzed:	0.0080 ml(s)

Initial Pressure (psig): -1.34 Final Pressure (psig): 1.91

Canister Dilution Factor: 1.24

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**12,000**	1,100	**8,400**	780	
74-93-1	Methyl Mercaptan	**4,100,000**	1,500	**2,100,000**	780	
75-18-3	Dimethyl Sulfide	**480,000**	2,000	**190,000**	780	
624-92-0	Dimethyl Disulfide	**290,000**	1,500	**76,000**	390	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **Dirty Blank**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401576
ALS Sample ID: P1401576-004

Test Code:	ASTM D 5504-08	Date Collected:	4/12/14
Instrument ID:	Agilent 7890A/GC22/SCD	Time Collected:	11:40
Analyst:	Mike Conejo	Date Received:	4/17/14
Sample Type:	6.0 L Silonite Canister	Date Analyzed:	4/21/14
Test Notes:		Time Analyzed:	10:51
Container ID:	SSC00219	Volume(s) Analyzed:	0.10 ml(s)

Initial Pressure (psig): -1.11 Final Pressure (psig): 1.55

Canister Dilution Factor: 1.20

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	**880**	84	**630**	60	
74-93-1	Methyl Mercaptan	**230,000**	120	**120,000**	60	
75-18-3	Dimethyl Sulfide	**45,000**	150	**18,000**	60	
624-92-0	Dimethyl Disulfide	**89,000**	120	**23,000**	30	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Horizon Engineering, LLC**
Client Sample ID: **Method Blank**
Client Project ID: **Clearwater Paper Corporation / 5110**

ALS Project ID: P1401576
ALS Sample ID: P140421-MB

Test Code: ASTM D 5504-08
Instrument ID: Agilent 7890A/GC22/SCD
Analyst: Mike Conejo
Sample Type: 6.0 L Silonite Canister
Test Notes:

Date Collected: NA
Time Collected: NA
Date Received: NA
Date Analyzed: 4/21/14
Time Analyzed: 08:40
Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **Horizon Engineering, LLC**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1401576
Client Project ID: **Clearwater Paper Corporation / 5110** ALS Sample ID: P140421-LCS

Test Code: ASTM D 5504-08 Date Collected: NA
Instrument ID: Agilent 7890A/GC22/SCD Date Received: NA
Analyst: Mike Conejo Date Analyzed: 4/21/14
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: NA ml(s)
Test Notes:

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	ALS Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	2,050	**1,930**	**94**	66-131	
74-93-1	Methyl Mercaptan	1,890	**2,320**	**123**	68-160	

HORIZON ENGINEERING LLC
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Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

EPA METHOD 1
TRAVERSE POINT LOCATIONS

Client: Clearwater
Source: M+D 1
Date: 4/7/14

Facility Location: Lewiston - ID
Sample Location: 1A Horizontal from Port (SEE PHOTO)
Initials: TL, KRK

Traverse Point Number	Traverse Point Location (inches)
1	12 1/2
2	12 7/8
3	13 5/8
4	14 3/4
5	17 3/4
6	18 7/8
7	19 5/8
8	20
9	
10	
11	
12	

Duct Dimensions and Port Locations

Inside of far wall to outside of nipple, F 30 1/2"
Inside of near wall to outside of nipple, N 12"
Nearest downstream disturbance, A 72"
Nearest upstream disturbance, B 26"
Circular: Inside Diameter, F-N 8 1/2
Rectangular: Width ____" Depth ____"
Rectangular Equiv. Diameter: (2*W*D)/(W+D) ____"
Number of Ports: 20 (2 1/2" Diameters, reduced down to fit test gear with swoop)

Duct characteristics:

Construction: (Steel) PVC Fiberglas Other ____
Shape: (Circular) Rectangular Elliptical
Orientation: Vertical (Horizontal) Diagonal (~ angle: ___°)
Flow straighteners: Yes (No)
Stack Extension: Yes (No)
Cyclonic Flow Expected: Yes (No)
Cyclonic Flow Measured & Documented: Yes (No)
Average Null Angle <20°: Yes No (N/A)
Meets EPA M-1 Criteria: (Yes) No (If "No", explain why)

Test port sketch or comments SEE PHOTO

HORIZON ENGINEERING llc
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EPA METHOD 1
TRAVERSE POINT LOCATIONS

Client: Clearwater Paper
Source: M&D #1
Date: 4-9-14

Facility Location: Lewiston, ID
Sample Location: Sample Point 2A
Initials: TL

Traverse Point Number	Traverse Point Location (inches)
1	SEE
2	DATA
3	
4	LOCATION
5	
6	
7	
8	
9	
10	DATA
11	SHEET
12	

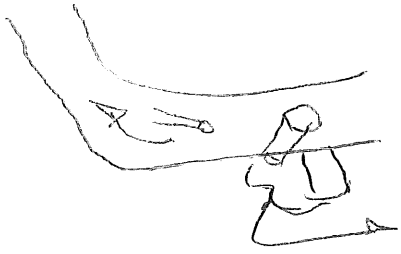
Duct Dimensions and Port Locations

Inside of far wall to outside of nipple, F 20 1/2"
Inside of near wall to outside of nipple, N 12"
Nearest downstream disturbance, A 28" ~~16 1/4~~" F2 4/10/14
Nearest upstream disturbance, B 66 1/4"
Circular: Inside Diameter, F-N 8 1/2"
Rectangular: Width ___" Depth ___"
Rectangular Equiv. Diameter: (2*W*D)/(W+D) ___"
Number of Ports: 2

Duct characteristics:

Construction: (Steel) PVC Fiberglas Other ___
Shape: (Circular) Rectangular Elliptical
Orientation: Vertical (Horizontal) Diagonal (~ angle: ___°)
Flow straighteners: Yes (No)
Stack Extension: Yes (No)
Cyclonic Flow Expected: Yes (No)
Cyclonic Flow Measured & Documented: Yes (No)
Average Null Angle <20°: Yes No (N/A)
Meets EPA M-1 Criteria: (Yes) No (If "No", explain why)

Test port sketch or comments SEE PHOTO



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EPA METHOD 1
TRAVERSE POINT LOCATIONS

Client: Clearwater Paper
Source: M&D #2
Date: 4/10/14

Facility Location: Lewiston, Id
Sample Location: 1B
Initials: TL

Traverse Point Number	Traverse Point Location (inches)
1	SEE LOCATION IN DATASHEET (SAME)
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

Duct Dimensions and Port Locations

Inside of far wall to outside of nipple, F 20 1/2"
Inside of near wall to outside of nipple, N 12"
Nearest downstream disturbance, A 17"
Nearest upstream disturbance, B 68 1/2"
Circular: Inside Diameter, F-N 8 1/2"
Rectangular: Width ~ " Depth ~ "
Rectangular Equiv. Diameter: (2*W*D)/(W+D) ~ "
Number of Ports: 2

Duct characteristics:

Construction: (Steel) PVC Fiberglas Other _____
Shape: (Circular) Rectangular Elliptical
Orientation: Vertical (Horizontal) Diagonal (~ angle: ___°)
Flow straighteners: Yes (No)
Stack Extension: Yes (No)
Cyclonic Flow Expected: Yes (No)
Cyclonic Flow Measured & Documented: Yes (No)
Average Null Angle <20°: Yes No (N/A)
Meets EPA M-1 Criteria: (Yes) No (If "No", explain why)

Test port sketch or comments SEE PHOTO

HORIZON ENGINEERING LLC
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

EPA METHOD 1
TRAVERSE POINT LOCATIONS

Client: Clearwater Paper
Source: M&D #2
Date: 4/10/14

Facility Location: Lewiston, Id
Sample Location: 2B
Initials: TL

Traverse Point Number	Traverse Point Location (inches)
1	12 1/4"
2	12 5/8"
3	13 3/8"
4	14 1/2"
5	17 1/2"
6	18 5/8"
7	19 3/8"
8	19 3/4"
9	
10	
11	
12	

Duct Dimensions and Port Locations

Inside of far wall to outside of nipple, F 20 1/4"
Inside of near wall to outside of nipple, N 11 3/4"
Nearest downstream disturbance, A 18"
Nearest upstream disturbance, B 67 3/4"
Circular: Inside Diameter, F-N 8 1/2"
Rectangular: Width ___" Depth ___"
Rectangular Equiv. Diameter: (2*W*D)/(W+D) ___"
Number of Ports: 2

Duct characteristics:

Construction: (Steel) PVC Fiberglas Other ___
Shape: (Circular) Rectangular Elliptical
Orientation: Vertical (Horizontal) Diagonal (~ angle: ___°)
Flow straighteners: Yes (No)
Stack Extension: Yes (No)
Cyclonic Flow Expected: Yes (No)
Cyclonic Flow Measured & Documented: Yes (No)
Average Null Angle <20°: (Yes) No N/A
Meets EPA M-1 Criteria: (Yes) No (If "No", explain why)

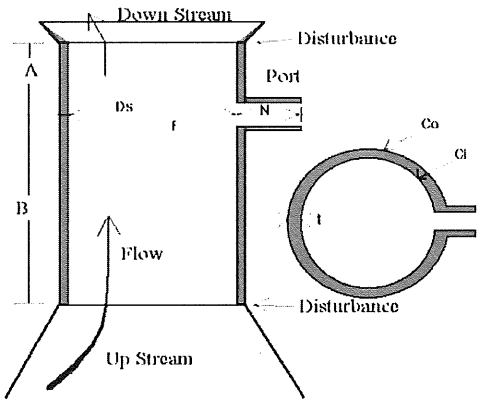
Test port sketch or comments SEE PHOTO

Traverse Point Locations

Clearwater Paper Corp.
M & D Digester #1-pt1A
Lewiston, ID
EPA 1

8-Apr-14

Outer Circumference	Co	in	
Wall thickness	t	in	
INSIDE of FAR WALL to OUTSIDE of Nipple	F	in	20.50
INSIDE of NEAR WALL to OUTSIDE of Nipple	N	in	12
STACK WALL to to OUTSIDE of Nipple	N-t	in	
DOWNstream Disturb	A	in	72.0
UPstream Disturb	B	in	26.0
Inner Diameter	Ds	in	8.5
Area	As	sqin	56.7
DOWNstream Ratio	A/Ds		8.47
UPstream Ratio	B/Ds		3.06
Minimum #Pts (Particulate)			24
Minimum #Pts/Diameter			12
Minimum #Pts (NON-Particulate)			16
Minimum #Pts/Diameter			8
Actual Points per Diameter			8
Actual Points Used			16



Trav Pt #No	Fract Stk ID (f)	Stack ID (Ds)	Actual Points (Dsxf)	Nearest 8ths (TP)	Adjusted Points (TP)	Traverse Points (TP + N)	Traverse Points (TP + N)
1	3.23%	8.5	0.3	0.250	0.5	12.5	12 1 / 2
2	10.47%	8.5	0.9	0.875	0.875	12.875	12 7 / 8
3	19.38%	8.5	1.6	1.625	1.625	13.625	13 5 / 8
4	32.32%	8.5	2.7	2.750	2.75	14.75	14 3 / 4
5	67.68%	8.5	5.8	5.750	5.75	17.75	17 3 / 4
6	80.62%	8.5	6.9	6.875	6.875	18.875	18 7 / 8
7	89.53%	8.5	7.6	7.625	7.625	19.625	19 5 / 8
8	96.77%	8.5	8.2	8.250	8	20	20

md_1_pt_1A.xls

Production/Process Data

M&D Sampling for MeOH (308) and TRS (16A)

Note: PI data historian is sampled at varying rates that are optimized by our Process Control group. Typically the values are collected about every 1-5 seconds.

				No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D
				SIC 8811	FIC 8689	FIC 8812	TIC 1817	SIC 8514	PIC 8715	PI 8814	TI 8810	fi8697a		
Units				rpm	gpm	gpm	Deg F	rpm	psig	psig	Deg F	ADT/Day	ODT/Day	Deg F
				PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	calculated	Field Gauge
Sample	Method	Start	Stop	Metering Scew Rate (rpm)	Cooking Liqr Volume	Millwtr FLOW to Exhst Collection Chmbr	Millwtr TEMP to Exhst Collection Chmbr	Bauer Valve RPM	Pri Exhst Steam Pressure	Pre-purge Steam Pressure	Exhaust Condnser Temp	Digester Prodctn Rate	Digester Prodctn Rate	Exhaust Collection Chamber Temp
1A	308	4/8/2014 8:07	4/8/2014 9:27	13.0	260.7	10.1	58.0	20.9	158.0	172.6	63.3	269.6	242.7	
(#1MD)		4/8/2014 9:58	4/8/2014 10:58	13.0	260.7	10.1	58.8	21.0	158.0	172.9	68.0	272.0	244.8	1:40pm
		4/8/2014 11:40	4/8/2014 13:09	13.0	260.7	10.0	56.0	21.1	158.0	172.7	84.5	271.6	244.4	175.0
1A	16A	4/8/2014 14:03	4/8/2014 15:03	13.0	258.2	9.9	54.2	21.0	158.0	172.4	102.6	271.6	244.4	
(#1MD)		4/8/2014 15:18	4/8/2014 16:18	13.0	256.7	9.9	54.5	20.9	158.0	173.1	103.2	273.4	246.1	7:30pm
		4/8/2014 16:38	4/8/2014 17:38	13.0	256.6	9.9	54.9	20.8	158.0	173.5	99.4	273.2	245.8	180.0
2A	308	4/9/2014 8:45	4/9/2014 9:45	13.4	266.7	10.0	49.1	20.8	158.0	172.5	64.0	276.8	249.1	
(#1MD)		4/9/2014 10:08	4/9/2014 11:08	12.1	279.8	10.0	49.6	21.0	158.0	171.5	64.8	249.1	224.2	7:00am
		4/9/2014 12:26	4/9/2014 13:26	13.0	277.1	10.0	49.9	21.2	158.0	172.0	75.2	283.0	254.7	170.0
2A	16A	4/9/2014 13:40	4/9/2014 14:40	13.5	283.1	10.0	50.2	21.1	158.0	172.5	80.0	282.3	254.0	
(#1MD)		4/9/2014 14:47	4/9/2014 15:47	13.5	282.4	9.9	50.6	21.0	158.0	172.4	82.4	277.2	249.5	2:00pm
		4/9/2014 15:55	4/9/2014 16:55	13.5	281.1	9.9	50.8	20.9	158.0	171.9	80.7	274.1	246.7	175.0
1B	308	4/10/2014 7:40	4/10/2014 8:46	13.0	285.9	9.9	49.9	21.3	158.0	171.4	54.7	274.1	246.7	7:00am
(#2MD)		4/10/2014 9:23	4/10/2014 10:43	13.0	282.4	9.9	48.0	21.2	158.0	171.8	59.6	274.8	247.3	185.0
		4/10/2014 10:56	4/10/2014 11:56	13.0	279.0	9.9	47.9	21.2	158.0	172.3	67.3	273.9	246.5	
1B	16A	4/10/2014 12:46	4/10/2014 13:46	13.0	273.9	10.0	48.5	21.1	158.0	172.6	89.4	273.3	246.0	1:00pm
(#2MD)		4/10/2014 13:53	4/10/2014 14:53	13.0	269.1	10.0	48.8	21.1	158.0	173.4	92.4	272.8	245.5	180.0
		4/10/2014 15:00	4/10/2014 16:00	13.0	267.9	10.1	49.8	21.0	158.0	173.5	93.9	271.9	244.7	
2B	308	4/11/2014 7:45	4/11/2014 8:45	12.9	259.9	10.0	46.7	20.9	158.0	172.8	55.7	273.7	246.3	7:00am
(#2MD)		4/12/2014 7:00	4/12/2014 8:00	9.2	232.1	10.0	50.4	20.9	158.0	172.8	56.3	222.5	200.2	180.0
(taken on 2 days)		4/12/2014 8:14	4/12/2014 9:14	10.9	236.1	10.0	51.3	21.0	158.0	173.4	58.9	248.7	242.7	
2B	16A	4/12/2014 9:24	4/12/2014 10:24	12.0	246.9	10.1	51.4	21.0	158.0	173.8	61.7	266.0	239.4	7:00am
(#2MD)		4/12/2014 10:31	4/12/2014 11:31	12.7	244.7	10.1	51.1	21.0	158.0	173.5	65.6	270.9	243.8	180.0
		4/12/2014 11:35	4/12/2014 12:35	13.0	236.9	10.1	51.3	20.9	158.0	174.9	75.1	273.1	245.7	

				No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D
				SIC 8911	FIC 8739	FIC 8912	TIC 1817	SIC 8534	PIC 8744	PI 8914	TI 8910	fi8697b		
Units				rpm	gpm	gpm	Deg F	rpm	psig	psig	Deg F	ADT/Day	ODT/Day	Deg F
				PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	calculated	Field Gauge
Sample	Method	Start	Stop	Metering Scew Rate (rpm)	Cooking Liqr Volume	Millwtr FLOW to Exhst Collection Chmbr	Millwtr TEMP to Exhst Collection Chmbr	Bauer Valve RPM	Pri Exhst Steam Pressure	Pre-purge Steam Pressure	Exhaust Condnser Temp	Digester Prodctn Rate	Digester Prodctn Rate	Exhaust Collection Chamber Temp
1A	308	4/8/2014 8:07	4/8/2014 9:27	8	211	10	58	22	158	182	54	214	192.4	
(#1MD)		4/8/2014 9:58	4/8/2014 10:58	5	193	10	59	22	158	183	63	158	141.8	1:00pm
		4/8/2014 11:40	4/8/2014 13:09	5	193	10	56	22	158	182	80	157	141.5	180.0
1A	16A	4/8/2014 14:03	4/8/2014 15:03	3	189	10	54	22	158	182	99	133	119.5	
(#1MD)		4/8/2014 15:18	4/8/2014 16:18	3	189	10	54	22	158	182	141	110	99.3	7:30pm
		4/8/2014 16:38	4/8/2014 17:38	3	189	10	55	22	158	182	150	110	99.4	180.0
2A	308	4/9/2014 8:45	4/9/2014 9:45	11	266	10	49	22	158	176	58	234	210.9	
(#1MD)		4/9/2014 10:08	4/9/2014 11:08	5	171	10	50	22	158	181	124	209	188.3	7:00am
		4/9/2014 12:26	4/9/2014 13:26	7	240	10	50	22	158	175	90	137	123.1	160.0
2A	16A	4/9/2014 13:40	4/9/2014 14:40	11	275	10	50	22	158	175	74	238	214.2	
(#1MD)		4/9/2014 14:47	4/9/2014 15:47	11	271	10	51	22	158	176	71	238	214.6	2:00pm
		4/9/2014 15:55	4/9/2014 16:55	11	270	10	51	22	158	177	71	236	212.3	170.0
1B	308	4/10/2014 7:40	4/10/2014 8:46	11	271	10	50	22	158	177	47	240	215.6	7:00am
(#2MD)		4/10/2014 9:23	4/10/2014 10:43	11	268	10	48	22	158	178	54	240	216.2	165.0
		4/10/2014 10:56	4/10/2014 11:56	12	266	10	48	22	158	178	64	239	215.5	
1B	16A	4/10/2014 12:46	4/10/2014 13:46	12	261	10	48	22	158	178	79	239	215.0	1:00pm
(#2MD)		4/10/2014 13:53	4/10/2014 14:53	11	259	10	49	22	158	179	82	238	214.6	170.0
		4/10/2014 15:00	4/10/2014 16:00	12	259	10	50	22	158	179	81	238	213.9	
2B	308	4/11/2014 7:45	4/11/2014 8:45	11	265	10	47	22	158	178	47	239	215.2	7:00am
(#2MD)		4/12/2014 7:00	4/12/2014 8:00	12	292	10	50	22	158	178	47	235	211.8	160.0
(taken on 2 days)		4/12/2014 8:14	4/12/2014 9:14	11	271	10	51	22	158	178	51	236	242.7	
2B	16A	4/12/2014 9:24	4/12/2014 10:24	11	270	10	51	22	158	178	55	238	213.9	7:00am
(#2MD)		4/12/2014 10:31	4/12/2014 11:31	11	258	10	51	22	158	179	60	240	215.9	170.0
		4/12/2014 11:35	4/12/2014 12:35	11	250	10	51	22	158	180	69	239	214.8	

Sawdust Species Data (%)

Date	hemlock/spruce	Doulgas fir	pine	cedar	true fir	Hardwood
2/23/14	56 (49/7)	23	5	12	4	T
3/26/2014	49 (44/5)	24	18	4	5	T

Note: PI data historian is sampled at varying rates that are optimized by our Process Control group. Typically the values are collected about every 1-5 seconds.

							No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D	No.1 M&D
			LAB-CD-SD-MOIST	WIC8023	MD.RJCT. TRUCKS			SIC 8811	FIC 8689	FIC 8812	TIC 1817	SIC 8514	PIC 8715	PI 8814	TI 8810
Units								rpm	gpm	gpm	Deg F	rpm	psig	psig	Deg F
			Moisture	Wood	Reject			PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	PI Data
Date	Start	End	%	tons/hr	Trucks	Sawdust Mass Feed Rate	Metering Scew Rate (rpm)	Cooking Liqr Volume	Millwtr FLOW to Exhst Collection Chmbr	Millwtr TEMP to Exhst Collection Chmbr	Bauer Valve RPM	Pri Exhst Steam Pressure	Pre-purge Steam Pressure	Exhaust Condnser Temp
3/9/2014	3/9/14 5:00 AM	3/10/14 5:00 AM	54.3	48.2	1.0	526.3	11.5	257.1	10.0	57.8	20.9	158.0	171.3	67.4
3/10/2014	3/10/14 5:00 AM	3/11/14 5:00 AM	56.8	48.7	1.0	503.1	12.2	259.4	10.0	57.3	21.0	158.0	171.3	59.6
3/11/2014	3/11/14 5:00 AM	3/12/14 5:00 AM	51.5	51.5	1.0	596.5	12.2	283.9	10.0	53.0	21.0	158.0	170.4	63.3
3/12/2014	3/12/14 5:00 AM	3/13/14 5:00 AM	55.5	51.5	0.0	550.5	12.3	268.0	10.0	56.5	21.1	158.0	171.1	64.9
3/13/2014	3/13/14 5:00 AM	3/14/14 5:00 AM	57.5	50.6	1.0	513.6	12.5	262.3	10.0	57.0	21.1	158.0	171.3	64.7
3/14/2014	3/14/14 5:00 AM	3/15/14 5:00 AM	57.8	44.2	1.0	445.4	10.4	238.8	10.0	58.9	20.9	158.0	171.5	58.7
3/15/2014	3/15/14 5:00 AM	3/16/14 5:00 AM	60.3	36.9	0.0	352.2	8.3	201.7	10.0	49.0	21.0	158.0	172.8	64.5
3/16/2014	3/16/14 5:00 AM	3/17/14 5:00 AM	57.5	28.9	1.0	292.3	6.1	169.0	10.0	44.3	19.7	158.0	171.6	84.7
3/17/2014	3/17/14 5:00 AM	3/18/14 5:00 AM	53.8	22.4	0.0	249.0	4.5	138.9	10.0	54.8	19.9	155.3	168.0	117.2
3/18/2014	3/18/14 5:00 AM	3/19/14 5:00 AM	56.8	43.6	0.0	452.3	10.0	238.3	10.1	45.9	21.1	158.4	170.9	61.3
3/19/2014	3/19/14 5:00 AM	3/20/14 5:00 AM	57.3	43.0	1.0	437.9	10.2	240.6	10.0	41.9	21.0	159.3	171.7	59.3
3/20/2014	3/20/14 5:00 AM	3/21/14 5:00 AM	54.5	40.0	1.0	434.5	9.6	232.3	10.0	42.6	20.9	158.0	171.5	63.5
3/21/2014	3/21/14 5:00 AM	3/22/14 5:00 AM	52.3	38.4	0.0	440.4	9.0	227.0	10.0	42.2	21.1	158.0	171.4	56.7
3/22/2014	3/22/14 5:00 AM	3/23/14 5:00 AM	55.0	44.6	1.0	478.5	10.7	250.4	10.0	46.7	21.0	158.0	170.9	60.9
3/23/2014	3/23/14 5:00 AM	3/24/14 5:00 AM	57.0	47.0	1.0	481.9	11.2	265.0	10.0	47.0	21.0	158.0	172.1	62.4
3/24/2014	3/24/14 5:00 AM	3/25/14 5:00 AM	56.5	53.2	0.0	555.1	13.3	288.3	10.0	47.2	21.0	158.0	171.3	65.7
3/25/2014	3/25/14 5:00 AM	3/26/14 5:00 AM	52.8	46.4	1.0	523.8	11.4	254.3	10.0	55.5	20.9	158.0	171.9	60.7
3/26/2014	3/26/14 5:00 AM	3/27/14 5:00 AM	53.5	44.2	1.0	489.9	11.1	243.4	10.0	59.4	20.9	158.0	171.5	64.7
3/27/2014	3/27/14 5:00 AM	3/28/14 5:00 AM	54.3	46.1	1.0	503.2	11.7	259.0	10.0	55.5	21.0	158.0	170.6	59.8
3/28/2014	3/28/14 5:00 AM	3/29/14 5:00 AM	54.8	51.5	0.0	559.5	12.9	275.2	10.0	58.0	20.9	158.0	170.3	60.3
3/29/2014	3/29/14 5:00 AM	3/30/14 5:00 AM	57.0	51.9	1.0	532.8	13.0	269.6	10.0	58.9	20.9	158.0	170.6	65.2
3/30/2014	3/30/14 5:00 AM	3/31/14 5:00 AM	56.5	52.6	1.0	546.4	13.4	279.2	10.1	57.2	21.0	158.0	170.6	59.9
3/31/2014	3/31/14 5:00 AM	4/1/14 5:00 AM	58.3	52.5	1.0	523.7	13.5	276.9	10.0	57.5	21.0	158.0	170.9	65.6
4/1/2014	4/1/14 5:00 AM	4/2/14 5:00 AM	54.8	41.3	1.0	446.2	10.7	232.3	8.7	58.4	20.9	157.8	171.0	85.3
4/2/2014	4/2/14 5:00 AM	4/3/14 5:00 AM	46.8	48.7	1.0	620.0	12.6	270.8	10.0	58.5	21.0	158.0	170.9	64.5
4/3/2014	4/3/14 5:00 AM	4/4/14 5:00 AM	52.9	46.4	1.0	522.1	11.9	268.1	10.0	57.9	21.0	158.0	170.5	69.2
4/4/2014	4/4/14 5:00 AM	4/5/14 5:00 AM	52.0	45.9	1.0	525.6	11.5	270.6	10.0	57.4	21.0	158.0	171.1	65.3
4/5/2014	4/5/14 5:00 AM	4/6/14 5:00 AM	52.3	40.1	0.0	459.0	9.6	238.9	10.0	58.2	21.0	158.0	171.6	67.6
4/6/2014	4/6/14 5:00 AM	4/7/14 5:00 AM	55.3	52.6	1.0	561.8	13.6	279.8	10.0	57.6	21.0	158.0	171.9	66.8
4/7/2014	4/7/14 5:00 AM	4/8/14 5:00 AM	53.8	52.0	1.0	574.0	14.0	283.4	10.0	59.2	21.0	158.0	172.4	76.0
4/8/2014	4/8/14 5:00 AM	4/9/14 5:00 AM	54.3	48.6	1.0	530.4	13.1	259.4	10.0	55.6	20.9	158.0	173.0	78.1

4/9/2014	4/9/14 5:00 AM	4/10/14 5:00 AM	49.8	38.5	0.0	464.5	9.5	238.6	10.0	50.7	21.0	158.0	172.5	67.8
4/10/2014	4/10/14 5:00 AM	4/11/14 5:00 AM	50.5	47.9	0.0	568.7	13.0	268.1	10.0	49.6	21.2	158.0	172.8	68.8
4/11/2014	4/11/14 5:00 AM	4/12/14 5:00 AM	51.0	18.6	1.0	216.0	4.1	136.1	5.9	51.5	21.0	146.3	164.2	125.4
4/12/2014	4/12/14 5:00 AM	4/13/14 5:00 AM	53.0	39.1	0.0	441.6	10.4	231.4	10.1	50.4	20.9	158.0	173.3	74.2
4/13/2014	4/13/14 5:00 AM	4/14/14 5:00 AM	52.0	31.2	1.0	356.6	7.4	196.6	8.8	51.1	21.0	157.6	172.3	106.0
4/14/2014	4/14/14 5:00 AM	4/15/14 5:00 AM	52.2	44.4	1.0	506.5	10.9	260.6	10.0	49.6	21.1	158.0	171.7	72.4
4/15/2014	4/15/14 5:00 AM	4/16/14 5:00 AM	28.3	51.4	1.0	882.8	13.0	291.1	10.1	48.7	20.9	158.0	169.9	63.9
4/16/2014	4/16/14 5:00 AM	4/17/14 5:00 AM	56.3	49.9	1.0	520.8	12.0	287.0	10.0	46.7	20.9	158.0	169.6	66.0
4/17/2014	4/17/14 5:00 AM	4/18/14 5:00 AM	55.9	50.8	1.0	535.2	12.0	277.7	9.9	48.8	21.0	158.0	170.1	66.3

No.1 M&D	No.1 M&D				No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D	No.2 M&D
fi8697a						SIC 8911	FIC 8739	FIC 8912	TIC 1817	SIC 8534	PIC 8744	PI 8914	TI 8910	fi8697b	
ADT/Day	Deg F					rpm	gpm	gpm	Deg F	rpm	psig	psig	Deg F	ADT/Day	Deg F
PI Data	Field Gauge	Moisture	Wood	Reject		PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	PI Data	Field Gauge
Digester Prodctn Rate	Exhaust Collection Chamber Temp	%	tons/hr	Trucks	Sawdust Mass Feed Rate	Metering Scew Rate (rpm)	Cooking Liqr Volume	Millwtr FLOW to Exhst Collection Chmbr	Millwtr TEMP to Exhst Collection Chmbr	Bauer Valve RPM	Pri Exhst Steam Pressure	Pre-purge Steam Pressure	Exhaust Condnser Temp	Digester Prodctn Rate	Exhaust Collection Chamber Temp
260.6	195	54.3	44.4	1.0	485.0	10.7	250.2	10.0	57.8	22.0	158.0	177.3	56.5	233.6	185
269.1	193	56.8	44.4	1.0	458.5	11.3	247.5	10.0	57.3	22.0	158.0	177.5	51.5	238.3	185
271.1	187	51.5	47.2	1.0	546.1	11.4	272.3	10.0	53.0	22.0	158.0	175.9	53.6	240.7	180
272.0	190	55.5	46.8	0.0	500.2	11.3	260.4	10.0	56.5	22.0	158.0	176.6	54.2	240.3	175
273.1	190	57.5	44.8	1.0	454.0	10.8	258.6	10.0	57.0	22.0	158.0	176.7	61.1	229.7	178
253.1	190	57.8	43.6	1.0	439.8	10.2	247.4	10.0	58.9	22.0	158.0	177.4	50.3	233.2	185
222.9	185	60.3	36.1	0.0	344.8	8.3	218.5	10.0	49.0	22.0	158.0	179.1	54.9	213.1	180
195.5	190	57.5	28.1	1.0	284.0	6.1	184.2	10.9	44.3	19.7	149.8	168.1	78.6	188.7	185
192.5	190	53.8	20.5	0.0	227.3	4.7	143.6	14.6	54.8	20.9	150.9	171.3	111.1	197.5	185
247.5	191	56.8	43.7	0.0	453.2	10.2	254.1	10.0	45.9	22.0	158.4	177.9	49.6	231.8	184
248.2	190	57.3	45.1	1.0	460.0	11.0	260.4	10.0	41.9	22.0	159.3	178.2	52.1	235.4	182
237.5	190	54.5	41.0	1.0	444.4	10.0	250.4	10.0	42.6	22.0	158.4	178.6	47.3	227.8	180
230.6	190	52.3	37.2	0.0	426.4	9.0	247.3	10.0	42.2	22.0	158.0	178.6	46.1	218.4	180
250.5	190	55.0	42.6	1.0	457.4	10.2	255.6	10.0	46.7	22.0	158.0	177.8	50.3	229.2	180
248.1	190	57.0	42.1	1.0	431.6	10.0	253.6	10.0	47.0	22.0	158.0	178.5	69.3	218.5	175
272.9	190	56.5	36.1	0.0	376.8	8.7	219.2	8.8	47.2	19.8	135.9	153.0	81.4	179.5	175
260.5	185	52.8	45.4	1.0	511.8	11.3	257.6	10.0	55.5	22.0	158.0	177.5	53.7	236.4	180
255.7	193	53.5	44.3	1.0	492.1	11.1	254.4	10.0	59.4	22.0	158.0	177.5	56.8	233.0	184
263.3	191	54.3	46.2	1.0	504.3	11.6	261.5	10.0	55.5	22.0	158.0	176.7	51.2	237.4	183
273.0	190	54.8	47.2	0.0	512.4	11.4	264.6	10.0	58.0	22.0	158.0	176.1	51.8	238.5	182
274.4	190	57.0	49.6	1.0	508.8	11.9	266.8	10.0	58.9	22.0	158.0	176.3	55.9	240.9	180
275.0	185	56.5	48.8	1.0	507.1	12.0	268.6	10.0	57.2	22.0	158.0	176.4	50.8	240.7	180
275.3	185	58.3	46.4	1.0	461.8	11.5	261.1	10.0	57.5	22.0	158.0	176.0	55.2	239.1	175
252.2	185	54.8	37.3	1.0	402.1	9.4	221.5	10.0	58.4	22.0	157.8	177.1	73.8	222.3	180
269.8	190	46.8	43.6	1.0	555.0	11.3	255.0	10.0	58.5	22.0	158.0	176.5	55.2	238.2	180
264.7	188	52.9	43.8	1.0	492.6	11.4	261.7	10.0	57.9	22.0	158.0	177.0	58.2	237.2	172
257.8	190	52.0	43.4	1.0	496.9	11.2	261.1	10.0	57.4	22.0	158.0	177.9	59.3	231.8	178
231.8	180	52.3	37.5	0.0	429.6	9.2	238.4	10.0	58.2	22.0	158.0	178.8	58.4	214.7	175
276.7	185	55.3	46.2	1.0	493.0	12.0	256.8	10.0	57.6	22.0	158.0	178.0	59.3	241.4	175
276.2	185	53.8	44.1	1.0	487.1	12.0	255.1	10.0	59.2	22.0	158.0	178.6	67.1	240.0	175
272.6	185	54.3	27.2	1.0	296.4	5.8	208.7	10.0	55.6	22.0	158.0	180.6	90.9	160.5	165

222.8	170	49.8	31.9	0.0	384.1	7.3	227.5	10.0	50.7	22.0	157.9	177.9	73.0	182.7	160
272.4	185	50.5	43.2	0.0	513.4	11.5	263.6	10.0	49.6	22.0	158.0	178.0	59.8	238.1	165
185.9	180	51.0	18.6	1.0	216.4	4.1	148.4	5.9	51.5	21.9	153.0	172.7	117.6	178.5	160
235.1	180	53.0	38.8	0.0	437.2	10.2	252.0	10.0	50.4	22.0	158.0	178.1	66.9	215.5	170
217.5	190	52.0	30.4	1.0	347.0	7.1	203.9	8.3	51.1	22.0	157.6	177.2	88.2	200.2	190
253.4	190	52.2	44.5	1.0	507.2	10.7	274.6	10.0	49.6	22.0	158.0	177.1	63.0	230.2	195
275.6	180	28.3	48.7	1.0	836.5	12.0	283.2	10.0	48.7	22.0	158.0	176.0	58.2	242.4	180
268.7	180	56.3	48.2	1.0	502.9	11.5	288.0	10.0	46.7	22.0	158.0	176.1	59.3	240.6	180
267.0	175	55.9	49.8	1.0	524.5	11.6	286.6	10.0	48.8	22.0	158.0	174.9	54.0	241.7	180

Calibration Information

Liter Meters
Standard Meter
Pitots
Shortridge Micromanometer
Thermocouples and Indicators
Barometer

Biannual Liter Meter Calibration

Method	EPA M-5 #7.2		Date	1/9/14															
Location	Horizon Shop		Pb=	30.1	(in Hg)														
Meter Box ID	1		Ta=	54	(°F)												OLD	New	Change
Meter ID	000499HE		Tamb	513.67	(°R)												7/22/13	1/9/14	(+/-)
calibrated by	PT		Y=	1.0059	Standard Meter												0.9669	0.99559	2.9%
			Leak check																
			Rate	0	in/min @	27	inches H20												
												Standard ID 16894627							
		FIELD METER						STANDARD METER						Time		Allowable			
	Meter Pressure H20"	Meter (liters)	Net (liters)	Tdi (°F)	Tdo (°F)	To (°R)	Tm (°R)	Meter (liters)	Net (liters)	Tdi (°F)	Tdo (°F)	To (°R)	Tm (°R)	t (min)	Y	Y 0.02			
Initial	1.6	32.82	10.30	57	58	517.67	517.42	4.47	10.24	55	55	514.67	514.67	4.0	1.00147	0.0059			
Final		43.12		58	58			14.71		55	55					pass			
Initial	1.2	43.45	10.81	58	58	517.67	517.67	15.08	10.59	55	55	514.67	514.67	6.0	0.98828	0.0073			
Final		54.26		58	58			25.67		55	55					pass			
Initial	1.0	54.73	9.50	58	58	518.17	518.17	25.97	9.38	55	55	515.17	514.92	8.0	0.99703	0.0014			
Final		64.23		59	59			35.35		55	56					pass			
															0.99559				

Post-Test Liter Meter Calibration

Method	EPA M-5 #7.2	Date	4/14/14		
Location	Horizon Shop	Pb=	30.5	(in Hg)	
Meter Box ID	LBM1	Ta=	60	(°F)	
Meter ID	5276054	Tamb	519.67	(°R)	
calibrated by	JS	Y=	0.9914	Standard Meter	
		Leak check			
		Rate	0	in/min @ 5	inches H_20

	POST	
6mo.	New	Change
1/19/14	4/14/14	(+/-)
0.99559	0.97682	-1.9%

		FIELD METER						STANDARD METER						Time		Allowable
	Meter Pressure H20"	Meter (liters)	Net (liters)	Tdi (°F)	Tdo (°F)	To (°R)	Tm (°R)	Meter (liters)	Net (liters)	Tdi (°F)	Tdo (°F)	To (°R)	Tm (°R)	t (min)	Y	Y 0.02
Initial	4.2	9871.37	20.45	63	63	522.67	522.92	8639.28	20.29	63	63	522.67	522.92	5.0	0.97378	0.0030
Final		9891.82		64	63			8659.57		64	63					pass
Initial	4.2	9891.82	20.48	64	63	523.17	523.42	8659.57	20.45	64	63	523.17	523.42	5.0	0.98002	0.0032
Final		9912.30		64	64			8680.02		64	64					pass
	4.2	9912.30	20.42	64	64	523.67	523.67	8680.02	20.32	64	64	523.67	523.67	5.0	0.97666	0.0002
Final		9932.72		64	64			8700.34		64	64					pass
															0.97682	

Biannual Liter Meter Calibration

Method	EPA M-5 #7.2	Date	2/14/14		
Location	Horizon Shop	Pb=	30.1	(in Hg)	
Meter Box ID	LMB3	Ta=	58	(°F)	
Meter ID	212028	Tamb	517.67	(°R)	
calibrated by	PT	Y=	1.0059	Standard Meter	
		Leak check Rate	Negative	0 in/min @	22 inches Hg
			Positive	0 in/min @	80 mm $H_2$0

	OLD	New	Change
	7/25/2013	2/14/14	(+/-)
	0.97310	0.98847	1.6%

		FIELD METER						STANDARD METER						Time		Allowable
	Meter Pressure H20"	Meter (liters)	Net (liters)	Tdi (°F)	Tdo (°F)	To (°R)	Tm (°R)	Meter (liters)	Net (liters)	Tdi (°F)	Tdo (°F)	To (°R)	Tm (°R)	t (min)	Y	Y 0.02
Initial	0.39	3.50	5.43	60	60	519.67	519.67	428.00	5.34	58	58	517.67	517.92	5.0	0.99198	0.0035
Final		8.928		60	60			433.34		59	58					pass
Initial	0.47	10.521	8.70	60	60	519.67	519.67	435.14	8.47	58	59	518.17	517.67	5.0	0.98151	0.0070
Final		19.225		60	60			443.61		57	58					pass
Initial	0.59	19.951	10.51	60	60	519.67	519.67	444.41	10.35	58	59	518.67	518.17	5.0	0.99193	0.0035
Final		30.462		60	60			454.76		58	59					pass
															0.98847	

HORIZON ENGINEERING 14-5110

Post Test Liter Meter Calibration

Method	EPA M-5 #7.2	Date	4/14/14		
Location	Horizon Shop	Pb=	30.5	(in Hg)	
Meter Box ID	LMB3	Ta=	60	(°F)	
Meter ID		Tamb	519.67	(°R)	
calibrated by	JH	Y=	0.98847	Standard Meter	
		Leak check Rate	Negative	0 in/min @	5 inches Hg
			Positive	0 in/min @	90 mm $H_2$0

	OLD	New	Change
	2/14/2014	4/14/14	(+/-)
	0.98847	0.96444	-2.5%

		FIELD METER						STANDARD METER						Time		Allowable
	Meter Pressure H20"	Meter (liters)	Net (liters)	Tdi (°F)	Tdo (°F)	To (°R)	Tm (°R)	Meter (liters)	Net (liters)	Tdi (°F)	Tdo (°F)	To (°R)	Tm (°R)	t (min)	Y	Y 0.02
Initial	0.39	0.00	11.21	67	67	527.17	527.17	8772.51	10.85	63	71	530.67	526.67	6.0	0.95716	0.0073
Final		11.205		68	68			8783.36		63	71					pass
Initial	0.39	0	18.81	68	68	527.67	527.67	8783.36	18.48	63	71	531.67	527.17	10.0	0.97124	0.0068
Final		18.808		68	68			8801.84		63	73					pass
Initial	0.39	0	34.90	69	69	529.17	529.17	8801.84	34.04	63	73	533.17	528.17	18.5	0.96492	0.0005
Final		34.904		70	70			8835.88		64	74					pass
															0.96444	

HORIZON ENGINEERING 14-5110

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Secondary Standard

DATE: 7/15/2013 Operator: Joe Ward

Meter No: 16894627				Meter Box ΔH@ 0.0000						Meter Box Yd 1.0013						Barometric Pressure: 29.79		
				Standard Meter Gas Volume (V_s)			Meter Box Gas Volume (V_{dg})			Std. Meter Temperature (t_s)			Meter Box Temperature (t_d)					
Q	P	H	Yds	Initial	Final	Vf	Initial	Final	Vf	Inlet	Outlet	Avg.	Inlet	Outlet	Avg.	Time	Yd	Run #
0.01	-0.50	0.00	1.0000	0.0	.500	.500	.000	.505	.505	77.0	77.0	77.0	79.0	79.0	79.0	33.70	0.9950	1
0.02	-0.50	0.00	1.0000	0.0	.500	.500	0.000	.504	.504	77.0	77.0	77.0	79.0	79.0	79.0	32.55	0.9970	1
0.01	-0.50	0.00	1.0000	0.0	.500	.500	.000	.504	.504	77.0	77.0	77.0	79.0	79.0	79.0	32.65	0.9970	1
0.03	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	.999	.999	77.0	77.0	77.0	79.0	79.0	79.0	29.48	1.0059	2
0.03	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	1.000	1.000	77.0	77.0	77.0	79.0	79.0	79.0	29.14	1.0050	2
0.03	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	1.000	1.000	77.0	77.0	77.0	79.0	79.0	79.0	29.35	1.0050	2
0.05	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	1.000	1.000	77.0	77.0	77.0	79.0	79.0	79.0	17.95	1.0050	3
0.05	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	1.000	1.000	77.0	77.0	77.0	79.0	79.0	79.0	17.83	1.0050	3
0.05	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	1.000	1.000	77.0	77.0	77.0	79.0	79.0	79.0	17.81	1.0050	3
0.07	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	.990	.990	77.0	77.0	77.0	79.0	79.0	79.0	13.70	1.0156	4
0.07	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	.990	.990	77.0	77.0	77.0	79.0	79.0	79.0	13.62	1.0156	4
0.07	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	.990	.990	77.0	77.0	77.0	79.0	79.0	79.0	13.47	1.0152	4
0.10	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	.997	.997	77.0	77.0	77.0	79.0	79.0	79.0	9.65	1.0077	5
0.10	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	.997	.997	77.0	77.0	77.0	79.0	79.0	79.0	9.71	1.0076	5
0.10	-0.50	0.00	1.0000	0.0	1.000	1.000	.000	.998	.998	77.0	77.0	77.0	79.0	79.0	79.0	9.74	1.0075	5
															AVERAGE		1.0059	

Operator Signature _____

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Pitot Calibrations

Method: #2 sec 4 WT Location: Whitaker Shop

Pitot	Date Tested	Cp	S	Pitot	Date Tested	Cp	S	Pitot	Date Tested	Cp	S	Pitot	Date Tested	Cp	S
6s-1	1/31/2014	0.8275	0.006	6s-13	1/30/2014	0.8376	0.005	8s-2	1/30/2014	0.8359	0.004	03070-10	1/0/1900	#DIV/0!	#DIV/0!
6s-2	1/30/2014	0.7963	0.002	6s-14	1/30/2014	0.8115	0.004	8s-3	1/30/2014	0.8297	0.006	T-4-1	1/0/1900	#DIV/0!	#DIV/0!
6s-3	1/30/2014	0.8460	0.004	7s-1	1/31/2014	0.8281	0.005	9s-1	1/31/2014	0.8438	0.001	P3-D6	1/0/1900	#DIV/0!	#DIV/0!
6s-4	1/31/2014	0.8462	0.007	7s-2	1/0/1900	#DIV/0!	#DIV/0!	9s-2	1/31/2014	0.8343	0.005	P4-B9	1/0/1900	#DIV/0!	#DIV/0!
6s-5	1/30/2014	0.7990	0.001	894-5	1/0/1900	#DIV/0!	#DIV/0!	10s-1	1/31/2014	0.8394	0.003	P10642	1/0/1900	#DIV/0!	#DIV/0!
6s-6	1/30/2014	0.8416	0.005	P3-N	2/25/2014	0.8060	0.002	11s-1	1/31/2014	0.8099	0.002	P10652	2/25/2014	0.8137	0.0036
6s-7	1/0/1900	#DIV/0!	#DIV/0!					14s-2	1/0/1900	#DIV/0!	#DIV/0!	P1066	1/0/1900	#DIV/0!	#DIV/0!
6s-8	1/30/2014	0.8458	0.003					SR-18	1/30/2014	0.8316	0.004	P10662	2/26/2014	0.8232	0.0038
6s-9	2/4/2014	0.8447	0.002					SR-36	4/2/2014	0.8212	0.003				
6s-10	2/27/2014	0.8262	0.004					SR-36-2	4/2/2014	0.8258	0.001				
6s-11	2/27/2014	0.8151	0.003					SR-48	5/2/2014	0.8158	0.003				
6s-12	1/30/2014	0.8289	0.007					SR-48A	1/30/2014	0.8395	0.007				

		DpP (P-Type)	DpS (S-Type)	Cp	dS	Ave Cp	S <0.01			DpP (P-Type)	DpS (S-Type)	Cp	dS	Ave Cp	S <0.01
	6s-1	0.350	0.510	0.8201	0.0073	0.8275	0.006		8s-2	0.380	0.540	0.8305	0.005	0.8359	0.004
Status	Pass	0.605	0.870	0.8256	0.0019	Cp Limits	Pass	Status	Pass	0.670	0.940	0.8358	0.000	Cp Limits	Pass
Date	1/31/2014	1.000	1.400	0.8367	0.0092	MAX/MIN	Pass	Date	1/30/2014	0.975	1.350	0.8413	0.005	MAX/MIN	Pass
Tester	MV					S Limits	Pass	Tester	JY					S Limits	Pass
	6s-2	0.325	0.500	0.7982	0.0019	0.7963	0.002		8s-3	0.330	0.480	0.8209	0.009	0.8297	0.006
Status	Pass	0.610	0.940	0.7975	0.0012	Cp Limits	Pass	Status	Pass	0.620	0.870	0.8357	0.006	Cp Limits	Pass
Date	1/30/2014	0.995	1.550	0.7932	0.0031	MAX/MIN	Pass	Date	1/30/2014	0.990	1.400	0.8325	0.003	MAX/MIN	Pass
Tester	JY					S Limits	Pass	Tester	JY					S Limits	Pass
	6s-3	0.320	0.440	0.8443	0.0017	0.8460	0.004		9s-1	0.290	0.400	0.8430	0.001	0.8438	0.001
Status	Pass	0.570	0.770	0.8518	0.0058	Cp Limits	Pass	Status	Pass	0.590	0.810	0.8449	0.001	Cp Limits	Pass
Date	1/30/2014	0.940	1.300	0.8418	0.0041	MAX/MIN	Pass	Date	1/31/2014	0.835	1.150	0.8436	0.000	MAX/MIN	Pass
Tester	JY					S Limits	Pass	Tester	MV					S Limits	Pass
	6s-4	0.310	0.420	0.8505	0.004	0.8462	0.007		9s-2	0.412	0.590	0.8268	0.008	0.8343	0.005
Status	Pass	0.600	0.810	0.8521	0.006	Cp Limits	Pass	Status	Pass	0.630	0.880	0.8377	0.003	Cp Limits	Pass
Date	1/31/2014	0.820	1.150	0.8360	0.010	MAX/MIN	Pass	Date	1/31/2014	0.825	1.150	0.8385	0.004	MAX/MIN	Pass
Tester	MV					S Limits	Pass	Tester	MV					S Limits	Pass
	6s-5	0.305	0.470	0.7975	0.001	0.7990	0.001		10s-1	0.290	0.400	0.8430	0.004	0.8394	0.003
Status	Pass	0.580	0.890	0.7992	0.000	Cp Limits	Pass	Status	Pass	0.670	0.930	0.8403	0.001	Cp Limits	Pass
Date	1/30/2014	0.980	1.500	0.8002	0.001	MAX/MIN	Pass	Date	1/31/2014	0.925	1.300	0.8351	0.004	MAX/MIN	Pass
Tester	JY					S Limits	Pass	Tester	MV					S Limits	Pass
	6s-6	0.320	0.450	0.8348	0.007	0.8416	0.005		11s-1	0.290	0.430	0.8130	0.003	0.8099	0.002
Status	Pass	0.610	0.840	0.8436	0.002	Cp Limits	Pass	Status	Pass	0.620	0.930	0.8083	0.002	Cp Limits	Pass
Date	1/30/2014	0.950	1.300	0.8463	0.005	MAX/MIN	Pass	Date	1/31/2014	1.000	1.500	0.8083	0.002	MAX/MIN	Pass
Tester	JY					S Limits	Pass	Tester	MV					S Limits	Pass
	6s-7			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		14s-2			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Status	#DIV/0!			#DIV/0!	#DIV/0!	Cp Limits	#DIV/0!	Status	#DIV/0!			#DIV/0!	#DIV/0!	Cp Limits	#DIV/0!
Date				#DIV/0!	#DIV/0!	MAX/MIN	#DIV/0!	Date				#DIV/0!	#DIV/0!	MAX/MIN	#DIV/0!
Tester						S Limits	#DIV/0!	Tester						S Limits	#DIV/0!
	6s-8	0.305	0.420	0.8436	0.002	0.8458	0.003		SR-18	0.350	0.490	0.8367	0.005	0.8316	0.004
Status	Pass	0.620	0.855	0.8430	0.003	Cp Limits	Pass	Status	Pass	0.570	0.820	0.8254	0.006	Cp Limits	Pass
Date	1/30/2014	0.960	1.300	0.8507	0.005	MAX/MIN	Pass	Date	1/30/2014	0.955	1.350	0.8327	0.001	MAX/MIN	Pass
Tester	JY					S Limits	Pass	Tester	JY					S Limits	Pass
	6s-9	0.310	0.425	0.8455	0.001	0.8447	0.002		SR-36	0.300	0.440	0.8175	0.004	0.8212	0.003
Status	Pass	0.640	0.875	0.8467	0.002	Cp Limits	Pass	Status	Pass	0.590	0.860	0.8200	0.001	Cp Limits	Pass
Date	2/4/2014	0.940	1.300	0.8418	0.003	MAX/MIN	Pass	Date	4/2/2014	0.940	1.350	0.8261	0.005	MAX/MIN	Pass
Tester	MV					S Limits	Pass	Tester	PT					S Limits	Pass
	6s-10	0.290	0.420	0.8226	0.004	0.8262	0.004		SR-36-2	0.300	0.430	0.8269	0.001	0.8258	0.001
Status	Pass	0.600	0.850	0.8318	0.006	Cp Limits	Pass	Status	Pass	0.610	0.880	0.8242	0.002	Cp Limits	Pass
Date	2/27/2014	0.970	1.400	0.8241	0.002	MAX/MIN	Pass	Date	4/2/2014	0.940	1.350	0.8261	0.000	MAX/MIN	Pass
Tester	PT					S Limits	Pass	Tester	PT					S Limits	Pass
	6s-11	0.310	0.460	0.8127	0.002	0.8151	0.003		SR-48	0.290	0.430	0.8130	0.003	0.8158	0.003
Status	Pass	0.600	0.890	0.8129	0.002	Cp Limits	Pass	Status	Pass	0.580	0.850	0.8178	0.002	Cp Limits	Pass
Date	2/27/2014	0.960	1.400	0.8198	0.005	MAX/MIN	Pass	Date	5/2/2014	0.960	1.400	0.8198	0.004	MAX/MIN	Pass
Tester	PT					S Limits	Pass	Tester	PT	1.550	2.300	0.8127	0.003	S Limits	Pass
	6s-12	0.320	0.445	0.8395	0.011	0.8289	0.007		SR-48A	0.330	0.455	0.8431	0.004	0.8395	0.007
Status	Pass	0.660	0.955	0.8230	0.006	Cp Limits	Pass	Status	Pass	0.615	0.840	0.8471	0.008	Cp Limits	Pass
Date	1/30/2014	0.970	1.400	0.8241	0.005	MAX/MIN	Pass	Date	1/30/2014	0.840	1.200	0.8283	0.011	MAX/MIN	Pass
Tester	JY					S Limits	Pass	Tester	JY					S Limits	Pass
	6s-13	0.310	0.430	0.8406	0.003	0.8376	0.005		03070-10			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Status	Pass	0.600	0.830	0.8417	0.004	Cp Limits	Pass	Status	#DIV/0!			#DIV/0!	#DIV/0!	Cp Limits	#DIV/0!
Date	1/30/2014	0.985	1.400	0.8304	0.007	MAX/MIN	Pass	Date				#DIV/0!	#DIV/0!	MAX/MIN	#DIV/0!
Tester	JY					S Limits	Pass	Tester						S Limits	#DIV/0!
	6s-14	0.325	0.490	0.8063	0.005	0.8115	0.004		T-4-1			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Status	Pass	0.630	0.925	0.8170	0.006	Cp Limits	Pass	Status	#DIV/0!			#DIV/0!	#DIV/0!	Cp Limits	#DIV/0!
Date	1/30/2014	0.940	1.400	0.8112	0.000	MAX/MIN	Pass	Date				#DIV/0!	#DIV/0!	MAX/MIN	#DIV/0!
Tester	JY					S Limits	Pass	Tester						S Limits	#DIV/0!
	7s-1	0.425	0.605	0.8298	0.002	0.8281	0.005		P3-D6			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Status	Pass	0.585	0.850	0.8213	0.007	Cp Limits	Pass	Status	#DIV/0!			#DIV/0!	#DIV/0!	Cp Limits	#DIV/0!
Date	1/31/2014	0.850	1.200	0.8332	0.005	MAX/MIN	Pass	Date				#DIV/0!	#DIV/0!	MAX/MIN	#DIV/0!
Tester	MV					S Limits	Pass	Tester						S Limits	#DIV/0!
	7s-2			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		P4-B9			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Status	#DIV/0!			#DIV/0!	#DIV/0!	Cp Limits	#DIV/0!	Status	#DIV/0!			#DIV/0!	#DIV/0!	Cp Limits	#DIV/0!
Date				#DIV/0!	#DIV/0!	MAX/MIN	#DIV/0!	Date				#DIV/0!	#DIV/0!	MAX/MIN	#DIV/0!
Tester						S Limits	#DIV/0!	Tester						S Limits	#DIV/0!
	894-5			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		P10642			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Status	#DIV/0!			#DIV/0!	#DIV/0!	Cp Limits	#DIV/0!	Status	#DIV/0!			#DIV/0!	#DIV/0!	Cp Limits	#DIV/0!
Date				#DIV/0!	#DIV/0!	MAX/MIN	#DIV/0!	Date				#DIV/0!	#DIV/0!	MAX/MIN	#DIV/0!
Tester						S Limits	#DIV/0!	Tester						S Limits	#DIV/0!

Date:	27-Nov-13		Location	Horizon Shop			Standard
Tester(s):	jy,dd						537/MB14
QA/QC	MEW						
Pt. 60, App. A, Method 2, 6.2 (Differential Pressure Gauges)							
Magnehelic ID	15 sec. High	leak check Low	Scale Inches	Shortridge in H2O	Manometer in H2O	Difference in H2O	Difference %
SR#1			electronic	0	0	< Set to Zero	
Date	12/12/2013			0.0720	0.0700	0.0020	2.9%
Personnel	DD			0.5050	0.5000	0.0050	1.0%
Status	PASS			1.0070	1.0000	0.0070	0.7%
				2.0310	2.0000	0.0310	1.6%
SR#2			electronic	0	0	< Set to Zero	
Date	12/12/2013			0.0514	0.0500	0.0014	2.8%
Personnel	DD			0.5101	0.5000	0.0101	2.0%
Status	PASS			1.0250	1.0000	0.0250	2.5%
				2.0510	2.0000	0.0510	2.6%
SR#3			electronic	0.0000	0.0000	< Set to Zero	
Date	01/06/2014			0.0512	0.0500	0.0012	2.4%
Personnel	JS			0.5106	0.5000	0.0106	2.1%
Status	PASS			1.0210	1.0000	0.0210	2.1%
				2.0180	2.0000	0.0180	0.9%
SR # 4	TV-2		electronic	0	0	< Set to Zero	
Date	11/27/2013			0.0950	0.10	-0.0050	5.0%
Personnel	jy			0.5090	0.50	0.0090	1.8%
Status	PASS			1.0250	1.00	0.0250	2.5%
				2.0250	2.00	0.0250	1.3%
SR#5			electronic	0	0	< Set to Zero	
Date							
Personnel							
Status							
SR # 6			electronic	0	0	< Set to Zero	
Date	01/02/2014			0.5500	0.56	-0.0050	0.9%
Personnel	CS			3.3100	3.30	0.0100	0.3%
Status	PASS			5.5080	5.50	0.0080	0.1%
				7.0850	7.10	-0.0150	0.2%
SR#7			electronic	0	0	< Set to Zero	
Date	11/27/2013			0.0506	0.05	0.0000	0.0%
Personnel	JY			0.5165	0.50	0.0165	3.3%
Status	PASS			1.0250	1.00	0.0250	2.5%
				2.0350	2.00	0.0350	1.8%

Calibration
Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 4039-5203394

Traceable® Certificate of Calibration for Water-Proof Thermometer °F/°C

Cust ID:Horizon Engineering, 13585 NE Whitaker Way, Attn. Joe Heffernan III, Portland, OR 97230 U.S.A. (RMA:978813)

Instrument Identification:

JS
JH

ID: JF Model: 90205-22 S/N: 111661400 Manufacturer:Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Temperature Calibration Bath TC-179	A45240		
Thermistor Module	A17118	2/13/14	1000332071
Temperature Probe	128	2/20/14	6-B48Z9-30-1
Temperature Calibration Bath TC-218	A73332		
Thermistor Module	A27129	11/09/13	1000327261
Temperature Probe	5202	11/30/14	15-B15PW-1-1

Certificate Information: **Amended Ref: 4039-5182673**

Technician: 68 Procedure: CAL-03 Cal Date: 6/24/13 Cal Due: 6/24/15

Test Conditions: 24.5°C 42.0 %RH 1016 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
°C		N.A.		0.000	-0.3	Y	-1.0	1.0	0.059	>4:1
°C		N.A.		100.000	100.2	Y	99.0	101.0	0.059	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio, Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Water-Proof Thermometer °F/°C should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Water-Proof Thermometer °F/°Cs change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

ACCREDITED
Calibration
Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 4039-5203387

Traceable® Certificate of Calibration for Water-Proof Thermometer °F/°C

Cust ID:Horizon Engineering, 13585 NE Whitaker Way, Attn:Joseph Heffernan, Portland, OR 97203 U.S.A. (RMA:978342)

Instrument Identification:

KRK

Model: 90205-22 S/N: 111661406 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Temperature Calibration Bath TC-179	A45240		
Thermistor Module	A17118	2/13/14	1000332071
Temperature Probe	128	2/20/14	6-B48Z9-30-1
Temperature Calibration Bath TC-218	A73332		
Thermistor Module	A27129	11/09/13	1000327261
Temperature Probe	5202	11/30/14	15-B15PW-1-1

Certificate Information: **Amended Ref: 4039-5132597**

Technician: 104 Procedure: CAL-03 Cal Date: 6/06/13 **Cal Due: 6/06/15**

Test Conditions: 22.0°C 45.0 %RH 1011 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
°C		N.A.		0.000	0.0	Y	-1.0	1.0	0.059	>4:1
°C		N.A.		100.000	100.1	Y	99.0	101.0	0.059	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Water-Proof Thermometer °F/°C should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Water-Proof Thermometer °F/°Cs change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

ACCREDITED
Calibration
Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 4039-5203392

Traceable® Certificate of Calibration for Water-Proof Thermometer °F/°C

Cust ID:Horizon Engineering, 13585 NE Whitaker Way, Attn. Joe Heffernan III, Portland, OR 97230 U.S.A. (RMA:978813)

Instrument Identification:

TL

Model: 90205-22 S/N: 111661402 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Temperature Calibration Bath TC-179	A45240		
Thermistor Module	A17118	2/13/14	1000332071
Temperature Probe	128	2/20/14	6-B48Z9-30-1
Temperature Calibration Bath TC-218	A73332		
Thermistor Module	A27129	11/09/13	1000327261
Temperature Probe	5202	11/30/14	15-B15PW-1-1

Certificate Information: **Amended Ref: 4039-5182675**

Technician: 68 Procedure: CAL-03 Cal Date: 6/24/13 **Cal Due: 6/24/15**

Test Conditions: 24.5°C 42.0 %RH 1016 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
°C		N.A.		0.000	-0.1	Y	-1.0	1.0	0.059	>4:1
°C		N.A.		100.000	100.0	Y	99.0	101.0	0.059	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Aaron Judice, Technical Manager

Maintaining Accuracy:

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Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Liter Meter Box Thermocouple Indicator Calibrations

Month: JULY		Testers:	PT		Location: Horizon Shop						
Thermocouple		Ambient			220 +/-				400 +/-		
Indicator	Channel	Standard, °F	Measured, °C	Measured, °F	Difference %	Standard, °F	Measured, °C	Measured, °F	Difference %	Standard, °F	Measured, °C	Measured, °F	Difference %
Liter Meter LMB 1	Probe	75		80	-0.94%	225		230	-0.73%	425		430	-0.57%
22-Jul-13	Filter	75		78	-0.56%	225		227	-0.29%	425		426	-0.11%
Qa/Qc-MEW	Aux 1	75		76	-0.19%	225		228	-0.44%	425		427	-0.23%
	Aux 2	75		76	-0.19%	225		228	-0.44%	425		426	-0.11%
	Meter In	75		77	-0.37%	225		227	-0.29%	425		426	-0.11%
	Meter Out	75		77	-0.37%	225		228	-0.44%	425		427	-0.23%
Liter Meter LMB 2	Probe	75		80	-0.94%	225		230	-0.73%	425		430	-0.57%
22-Jul-13	Filter	75		80	-0.94%	225		229	-0.58%	425		428	-0.34%
Qa/Qc-MEW	Aux 1	75		77	-0.37%	225		228	-0.44%	425		428	-0.34%
	Aux 2	75		78	-0.56%	225		228	-0.44%	425		427	-0.23%
	Meter In	75		77	-0.37%	225		228	-0.44%	425		428	-0.34%
	Meter Out	75		77	-0.37%	225		228	-0.44%	425		427	-0.23%
Liter Meter LMB 3	Probe	75		75	0.00%	225		226	-0.15%	425		426	-0.11%
25-Jul-13	Filter	75		75	0.00%	225		226	-0.15%	425		425	0.00%
Qa/Qc-MEW	Aux 1	75		75	0.00%	225		225	0.00%	425		425	0.00%
	Aux 2	75		75	0.00%	225		225	0.00%	425		425	0.00%
	Aux 3	75		75	0.00%	225		225	0.00%	425		425	0.00%
	Meter Out	75		75	0.00%	225		226	-0.15%	425		425	0.00%
Liter Meter ML4	Probe	75		76	-0.19%	225		227	-0.29%	425		426	-0.11%
24-Jul-13	Oven	75		76	-0.19%	225		224	0.15%	425		423	0.23%
Qa/Qc-MEW	Aux 1	75		78	-0.56%	225		228	-0.44%	425		426	-0.11%
	Aux 2	75		78	-0.56%	225		226	-0.15%	425		425	0.00%
	Meter In	75		77	-0.37%	225		226	-0.15%	425		425	0.00%
	Meter Out	75		77	-0.37%	225		227	-0.29%	425		426	-0.11%

Branom Instrument Co.
Since 1947
BRANOM INSTRUMENTATION

HE #554

CERTIFICATE OF CALIBRATION # 34279

Customer Name:	Amtest Air Quality	Branom Order #:	9-488139
Address:	PO Box 525 Preston, WA 98050	Certification Date: Re-certification Date:	30-Jul-12 30-Jul-13
PO#:	Cash Sale	Lab Temperature:	73.3°F
Instrument Make:	Altek	Lab Humidity:	43.8%
Model Number:	Series 22	Lab Technician:	Roy Person
Description:	Thermocouple Source	As Found Condition:	In tolerance
Serial Number:	8510116	As Left Condition:	In tolerance

Calibration Standard(s)

Make	Model	Serial Number	Cal Date	Date Due	Description
Fluke	8845A	1026016	10/06/11	10/06/2012	DMM

Branom Instrument Company guarantees that the following instrument meets or exceeds all published specifications and has been calibrated using standards that are traceable to the National Institute of Standards and Technology (NIST). The following certificate applies only to the instrument listed below. This certificate shall not be reproduced, except in full, without written approval by Branom Instrument Company.

Comments: None.

Corey Porter
Q.A. Manager

Grant Edgel Company
MFG. RED COMET OVENS
TELEPHONE 254-6524 (AREA CODE 503)
4233 N. E. 147TH AVENUE · P. O. BOX 20116 · PORTLAND, OREGON 97220

CERTIFICATE

HE 541

FOR

Altek Calibrator

Series 22

SN. 10663701

GRANT EDGEL PRIMARY STANDARDS LABORATORY
TEMPERATURE CALIBRATION
ID NO.
DATE
NEXT DUE
BY

Submitted By

Horizon Engineering

13585 NE Whittaker Way

Portland, OR 97230

Test	Error	Test	Error
-25°F	-1.5	275°F	+.9
+25°F	+1.0	325°F	+1.0
75°F	+1.2	375°F	+1.3
125°F	+1.0	425°F	+1.4
175°F	+1.3	475°F	+1.3
225°F	+1.3		

Certified By:
Fluke Model 724
Serial# 9806098
Resubmision Date:
2-1-13

The accuracy stated on this certificate is traceable to the NATIONAL INSTITUTE OF STANDARDS through certification documents on file in the Metrology Laboratory of the Grant Edgel Company.

Test Conditions

AMBIENT TEMP.: 69°F

REL. HUMIDITY: 54%

DATE: 10-20-12

REPORT NO.: 7120-45

SERVICE ORDER: 21244

P.O. NUMBER:

Authorized Signatures

PERFORMED BY: RG

APPROVED BY: Bob Edgel

RESUBMISSION DATE: 10-20-13

A Satisfied Customer is Our First Consideration

Grant Edgel Company

MFG. RED COMET OVENS

TELEPHONE 254-6524 (AREA CODE 503)

4233 N. E. 147TH AVENUE ✎ P. O. BOX 20116 ✎ PORTLAND, OREGON 97220

LABORATORY PRIMARY STANDARDS

CERTIFICATE

HE 542

FOR

Altek Calibrator

Series 22

SN. 10400304

GRANT EDGEL PRIMARY STANDARDS LABORATORY
TEMPERATURE CALIBRATION
ID NO.
DATE
NEXT DUE
BY

Submitted By

Horizon Engineering

13585 NE Whittaker Way

Portland, OR 97230

LABORATORY PRIMARY STANDARDS

Test	Error	Test	Error
-25°F	-1.1	275°F	+1.8
+25°F	-1.6	325°F	+1.6
75°F	-1.4	375°F	-1.4
125°F	-0.7	425°F	-1.3
175°F	-.6	475°F	-1.4
225°F	-0.7		

Certified By:
Fluke Model 724
Serial# 9806098
Resubmission Date:
2-1-13

The accuracy stated on this certificate is traceable to the NATIONAL INSTITUTE OF STANDARDS through certification documents on file in the Metrology Laboratory of the Grant Edgel Company.

Test Conditions

AMBIENT TEMP.: 69°F

REL. HUMIDITY: 54%

DATE: 10-20-12

REPORT NO.: 12J-6

SERVICE ORDER: 21244

P.O. NUMBER:

Authorized Signatures

PERFORMED BY: RG

APPROVED BY: Bob Edgel

RESUBMISSION DATE: 10-20-13

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Grant Edgel Company
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TELEPHONE 254-6524 (AREA CODE 503)
4233 N. E. 147TH AVENUE ◊ P. O. BOX 20116 ◊ PORTLAND, OREGON 97220

HE 543

CERTIFICATE

FOR

Omega Calibrator

Model CL-300-500F

SN. 647

GRANT EDGEL PRIMARY STANDARDS LABORATORY TEMPERATURE STANDARDIZATION
ID NO
DATE
NEXT DUE
BY

Submitted By

Horizon Engineering

13585 NE Whittaker Way

Portland, OR 97230

Test	Error	Test	Error
0°F	0.0	300°F	+.1
50°F	+.1	350°F	+.1
100°F	+.1	400°F	+.1
150°F	+.1	450°F	0.0
200°F	+.1	500°F	-.5
250°F	+.2		

Certified By:
Fluke Model 724
Serial# 9806098
Resubmission Date
2-1-13

The accuracy stated on this certificate is traceable to the NATIONAL INSTITUTE OF STANDARDS through certification documents on file in the Metrology Laboratory of the Grant Edgel Company.

Test Conditions

AMBIENT TEMP.: 69°F

REL. HUMIDITY: 54%

DATE: 10-20-12

REPORT NO.: 12J-4

SERVICE ORDER: 21244

P.O. NUMBER:

Authorized Signatures

PERFORMED BY: RG

APPROVED BY: Bob Edgel

RESUBMISSION DATE: 10-20-13

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4233 N. E. 147TH AVENUE • P. O. BOX 20116 • PORTLAND, OREGON 97220

CERTIFICATE

LABORATORY PRIMARY STANDARDS

FOR

Fluke 52

HE# 000197

GRANT EDGEL PRIMARY STANDARDS LABORATORY
ID NO.
DATE
NEXT DUE
BY

Submitted By

Horizon Engineering

13585 NE Whittaker Way

Portland, OR 97230

Test	Error	Test	Error
0°F	-1.4	400°F	-1.2
100°F	-1.8	500°F	-1.0
200°F	-1.0	1000°F	-.6
300°F	-,6	2000°F	0.0

Certified By: Fluke Model 724 Serial# 9806098
Resubmission Date: 2-1-13

The accuracy stated on this certificate is traceable to the NATIONAL INSTITUTE OF STANDARDS through certification documents on file in the Metrology Laboratory of the Grant Edgel Company.

Test Conditions

AMBIENT TEMP.: 69°F
REL. HUMIDITY: 54%
DATE: 10-20-12
REPORT NO.: 12J-3
SERVICE ORDER: 21244
P.O. NUMBER:

Authorized Signatures

PERFORMED BY: RG

APPROVED BY: Bob Edgel

RESUBMISSION DATE: 10-20-13

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Grant Edgel Company
MFG. RED COMET OVENS
TELEPHONE 254-6524 (AREA CODE 503)
4233 N. E. 147TH AVENUE · P. O. BOX 20116 · PORTLAND, OREGON 97220

CERTIFICATE

HE 540

FOR

VWR Thermometer

Model 23226-656

SN. 51214276

GRANT EDGEL PRIMARY STANDARDS LABORATORY
ID NO.
DATE
NEXT
BY

Submitted By

Horizon Engineering

13585 NE Whittaker Way

Portland, OR 97230

Test	Error
0°F	+.2
100°F	-.7
150°F	-.7
200°F	-.6

Certified By: Fluke Model 724 Serial# 9806098
Resubmission Date: 2-1-13

The accuracy stated on this certificate is traceable to the NATIONAL INSTITUTE OF STANDARDS through certification documents on file in the Metrology Laboratory of the Grant Edgel Company.

Test Conditions

AMBIENT TEMP.: 69°F
REL. HUMIDITY: 54%
DATE: 10-20-12
REPORT NO.: 12J-2
SERVICE ORDER: 21244
P.O. NUMBER:

Authorized Signatures

PERFORMED BY: RG

APPROVED BY: Bob Edgel

RESUBMISSION DATE: 10-20-13

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Barometer Calibration

Horizon Shop
2014 Calibrations
JM, JS, JH

QA/QC mew

BAROMETER CALIBRATIONS ELEVATION OF STANDARD 30 FT		inHg	inHg NWS	Diff %	inHg
TV 1	1/3/2014	30.40	30.27	0.4%	0.13
TV 2	1/3/2014	30.30	30.27	0.1%	0.03
TV 3	12/17/2013	30.30	30.25	0.2%	0.05
TV 4	1/9/2014	30.20	30.10	0.3%	0.10
TV 5	1/3/2014	30.40	30.27	0.4%	0.13
Portland Shop Barometer	12/17/2013	30.20	30.25	-0.2%	-0.05
Shortridge #1 (HE 276)	1/3/2014	30.50	30.27	0.8%	0.23
Shortridge #2 (HE 028)	12/17/2013	30.40	30.25	0.5%	0.15
Shortridge #3 (HE 226)	1/3/2014	30.20	30.27	-0.2%	-0.07
Shortridge #5 (HE 414)	12/17/2013	30.10	30.25	-0.5%	-0.15
Shortridge #6	1/3/2014	30.20	30.27	-0.2%	-0.07
Shortridge #7 (HE 324)	12/17/2013	30.30	30.25	0.2%	0.05

National Weather Service (PDX Int'l Airport)	12/17/2013	30.25
National Weather Service (PDX Int'l Airport)	1/3/2014	30.27
National Weather Service (PDX Int'l Airport)	1/9/2014	30.10

National Weather Service (AUBURN)

QA/QC Documentation
Procedures

Introduction The QA procedures outlined in the U. S. Environmental Protection Agency (EPA) test methods are followed, including procedures, equipment specifications, calibrations, sample extraction and handling, calculations, and performance tolerances. Many of the checks performed have been cited in the Sampling section of the report text. The results of those checks are on the applicable field data sheets in the Appendix.

Continuous Analyzer Methods Field crews operate the continuous analyzers according to the test method requirements, and Horizon's additional specifications. On site quality control procedures include:

- Analyzer calibration error before initial run and after a failed system bias or drift test (within ± 2.0% of the calibration span of the analyzer for the low, mid, and high-level gases or 0.5 ppmv absolute difference)
- System bias at low-scale (zero) and upscale calibration gases (within ± 5.0% of the calibration span or 0.5 ppmv absolute difference)
- Drift check (within ±3.0% of calibration span for low, and mid or high-level gases, or 0.5 ppmv absolute difference)
- System response time (during initial sampling system bias test)
- Checks performed with EPA Protocol 1 or NIST traceable gases
- Leak free sampling system
- Data acquisition systems record 10-second data points or one-minute averages of one second readings
- NO_2 to NO conversion efficiency (before each test)
- Purge time (≥ 2 times system response time and will be done before starting run 1, whenever the gas probe is removed and re-inserted into the stack, and after bias checks)
- Sample time (at least two times the system response time at each sample point)
- Sample flow rate (within approximately 10% of the flow rate established during system response time check)
- Interference checks for analyzers used will be included in the final test report
- Average concentration (run average ≤ calibration span for each run)
- Stratification test (to be done during run 1 at three(3) or twelve(12) points according to EPA Method 7E; Method 3A, if done for molecular weight only, will be sampled near the centroid of the exhaust; stratification is check not normally applicable for RATAs)

Manual Equipment QC Procedures On site quality control procedures include pre- and post-test leak checks on trains and pitot systems. If pre-test checks indicate problems, the system is fixed and rechecked before starting testing. If post-test leak checks are not acceptable, the test run is voided and the run is repeated. Thermocouples and readouts are verified in the field to read ambient prior to the start of any heating or cooling devices.

Sample Handling Samples taken during testing are handled to prevent contamination from other runs and ambient conditions. Sample containers are glass, Teflon™, or polystyrene (filter petri dishes) and are pre-cleaned by the laboratory and in the Horizon Engineering shop. Sample levels are marked on containers and are verified by the laboratory. All particulate sample containers are kept upright and are delivered to the laboratory by Horizon personnel.

Data Processing Personnel performing data processing double-check that data entry and calculations are correct. Results include corrections for field blanks and analyzer drift. Any abnormal values are verified with testing personnel and the laboratory, if necessary.

After results are obtained, the data processing supervisor validates the data with the following actions:

- verify data entry
- check for variability within replicate runs
- account for variability that is not within performance goals (check the method, testing, and operation of the plant)
- verify field quality checks

Equipment Calibrations Periodic calibrations are performed on each piece of measurement equipment according to manufacturers' specifications and applicable test method requirements. The Oregon Department of Environmental Quality (ODEQ) Source Testing Calibration Requirements sheet is used as a guideline. Calibrations are performed using primary standard references and calibration curves where applicable.

Dry Gas Meters Dry gas meters used in the manual sampling trains are calibrated at three rates using a standard dry gas meter that is never taken into the field. The standard meter is calibration verified by the Northwest Natural Gas meter shop once every year. Dry gas meters are post-test calibrated with documentation provided in test reports.

Thermocouples Sample box oven and impinger outlet thermocouples are calibration checked against an NIST traceable thermocouple and indicator system every six months at three points. Thermocouple indicators and temperature controllers are checked using a NIST traceable signal generator. Readouts are checked over their usable range and are adjusted if necessary (which is very unusual). Probe thermocouples are calibrated in the field using the ALT-011 alternate Method 2 calibration procedure, which is documented on the field data sheet for the first run the probe thermocouple was used.

Pitots Every six months, S-type pitots are calibrated in a wind tunnel at three points against a standard pitot using inclined manometers. They are examined for dents and distortion to the alignment, angles, lengths, and proximity to thermocouples before each test. Pitots are protected with covers during storage and handling until they are ready to be inserted in the sample ports.

Correspondence

Source Test Plan and Correspondence

HORIZON ENGINEERING LLC

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March 31, 2014 Project No. 5110

Ms. Roylene Cunningham
EPA – Region 10
1200 6th Avenue, Suite 900
OCE – 127
Seattle, Washington 98101

Mr. Zach Hedgpeth, P.E.
EPA – Region 10
1200 6th Avenue, Suite 900
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Seattle, Washington 98101

Re: Clearwater Paper Corporation in Lewiston, Idaho -- Required Testing Pursuant to EPA Request for Information, July 19, 2013

On behalf of Clearwater Paper Corporation (CLW) and in accordance with paragraph #3 of EPA's Request for Information (RFI), Horizon Engineering submits this Advance Notification that Horizon Engineering is scheduled to perform required testing at the above-referenced facility beginning the week of April 7, 2014. This also serves as the Test Plan, unless EPA notifies Horizon Engineering at least 5 days prior to the proposed test date of April 7, 2014. The elements required by EPA in the RFI for inclusion in a Test Plan are presented below.

1. **Sources To be Tested:** Internal process points associated with the M&D No. 1 and M&D No. 2 Digesters

2. **Test Locations:**
   - Sample Point 1A: M&D No. 1 Exhaust to Kone Bin
   - Sample Point 2A: M&D No. 1 Exhaust to Kone Bin
   - Sample Point 1B: M&D No. 2 Exhaust to Kone Bin
   - Sample Point 2B: M&D No. 2 Exhaust to Kone Bin

3. **Purpose of the Testing:** Compliance with the RFI and extension granted on August 28, 2013. After observing the pre-test feasibility study and receiving the results, EPA revised the scope of sampling by eliminating Sample Points 3 and 4 on each of the digesters. In accordance with EPA's response letter, dated February 20, 2014, testing Sample Points 1 and 2 is required no later than 60 days from the date of the letter.

Figure 1 - Process and Sample Point Diagram (See P&I diagram for additional details)

The sawdust pulping system includes two M&D continuous digesters, each operating at approximately 250 ADT/day of equivalent bleached pulp production. Two sawdust storage silos pneumatically feed sawdust to the top of a cyclone separator, where the wood and transport air are separated. On each line, the wood drops into a storage vessel known as the Kone bin, located below the cyclone. Each Kone bin typically contains 10 to 15 feet of wood during normal operation.

On each line, sawdust gravity feeds from the Kone bin into a metering screw, which feeds a rotary inlet valve known as the Bauer valve, before dropping into the digester itself. The rotary inlet valve contains 10 pockets. As the pockets rotate they are sealed against the casing of the valve. The seal prevents back-flow from the pressurized digester vessel.

Fresh steam is used in each rotary inlet valve to heat the sawdust, to pressurize the valve pockets, and to help push sawdust out of the valve pockets to purge the pocket. Sawdust then falls by gravity into the digester vessel. The majority of this steam is either discharged into the digester vessel with the sawdust, or is recycled from the discharge side of the valve to the inlet side of the valve via the primary exhaust line. Secondary exhaust from each rotary inlet valve flows to an exhaust chamber, where it is sprayed with a condensing shower of mill water. Any remaining material not condensed and injected into the sawdust through the metering screw will move through two lines into the bottom of the Kone bin. In addition to the secondary exhaust line, a line from the drop chute between the metering screw and the rotary inlet valve also flows to the exhaust chamber. (See Figure 1)

Once the wood enters the digester it falls onto a midfeather separating plate, where it is confined between constantly moving flights. The flights carry the sawdust down the top side of the midfeather, around the lower end of the digester, and then up the bottom half of the divided digester. When the sawdust reaches the top of the digester, it exits out of the discharge nozzle (on the bottom side of the digester) and falls into the surge tube, before going on to the blow tank. From the blow tank the sawdust pulp is washed and screened, prior to a final bleaching operation.

5. **Process Mode of Operation During Testing**: The operating mode during the testing will be at normal operating rates and conditions. The pulp from these digesters will be processed through a 4-stage brownstock washing line, and then through a 4-stage bleach plant. The pulp will be used in the manufacture of bleached paperboard.

6. **Pollutants to be Tested:** Methanol and TRS.[1]

7. **Test Methods to be Used:** Testing will be conducted in accordance with EPA methods in Title 40 Code of Federal Regulations Part 60 (40 CFR 60), Appendix A, July 1, 2011 and the Emission Measurement Technical Information Center's website, Test Methods Section (www.epa.gov/ttn/emc)

   Sample Points 1A, 2A, 1B and 2B:

Flow Rate:	Modified EPA Methods 1A and 2C (S- pitot flow traverses of duct <12") [2]
CO_2 and O_2:	Assume ambient molecular weight 28.96
Moisture:	ODEQ Method 4 (wet and dry bulb temperatures)
Methanol:	Modified EPA Method 308 (non-isokinetic, sorbent tube and impinger train technique with analysis by GC/FID)[2]
TRS:	Modified EPA Method 16A (silonite coated Summa canister with analysis by GC/SCD per ASTM D 5504-08) [2]

8. **Test Method Modifications:**

   Modified EPA Methods 1A and 2C:

   Two flow measurement ports are located at 90° angles on the horizontal ducts for process points 1A, 2A, 1B and 2B. The port location meets EPA Method 1A criteria, but only the side ports can be used for flow testing. The bottom ports cannot be used because when opened for access, process liquid and sawdust pour out. Therefore flow measurements will be taken from one traverse across the duct, through the side ports. The testers will clear the pitot lines as needed.

[1] TRS compounds analyzed will be dimethyl disulfide, dimethyl sulfide, hydrogen sulfide, and methyl mercaptan.
[2] See Section 8.

Significant safety concerns associated with testing the internal process gases through installed ports, as required by the RFI, were noted to EPA during the feasibility testing. In addition, the volatility of the conditions inherent in the process equipment may affect the validity of test results. For example, high moisture is expected to be a significant interference and may limit the ability to maintain a constant sampling rate. To address the safety concerns associated with sampling at the specified process points, CLW installed ports with piping and valves to close off the duct when the ports are open. The testers use a pipe adapter fitted to the outside of the flow ports for pitot access. Having discussed the port configurations and seen them first hand during the pre-test feasibility study, Horizon concludes that the use of an S-type pitot is essential for this testing. Due to the hazards associated with sampling, appropriate protective clothing including a full face canister style respirator will be worn to ensure the testers safety.

Modified EPA Method 308:

A third pipe port (1/4") is available with fittings for sample lines.

The EPA Method 308 sampling train will be modified in the following ways:
- Teflon tubing will be fitted on to the pipe port.
- Dilution air (N_2) will be introduced via heated sample line into the Teflon tubing, downstream from the connection to the pipe port.
- Chilled, empty impingers will be added as needed for moisture removal.

The amount of dilution air added will be measured by a mass flow controller capable of measuring 0-2 standard lpm, at 70°F. Based on the EPA Method 308 results obtained from the pre-test feasibility study, up to 95% dilution air could have been added without driving the MeOH below the analytical detection limit. We will target a minimum 50% dilution ratio. This will be achieved by setting the mass flow controller to half the sampling rate, i.e. if the EPA Method 308 sample train pump is pulling at 200 ml/min, the mass flow controller will be set to deliver 100 ml/min. The dilution approach will be the primary method of sample collection; the sample collection approach used during the pre-test feasibility study is proposed as a backup.

Modified EPA Method 16A

This method is for the TRS sampling of various Kraft plant sources. The principal of analysis is to scrub the sample of SO_2, oxidize the remaining TRS compounds, then measure as SO_2. The testing methodology of EPA Method 16A will be adapted for a different analysis technique; dry gas samples will be analyzed according to ASTM D 5504-08, by GC/SCD, for the speciated TRS compounds of interest.

The Modified EPA Method 16A sampling train will consist of:
- The temperature of the stack gas will be measured by psychrometry (ODEQ Method 4) every 5-10 minutes during each run.
- Unheated Teflon tubing will be fitted on to the pipe port.
- Dilution air (N_2) will be introduced via heated sample line into the Teflon tubing, downstream from the connection to the pipe port.
- The temperature of the mass flow controller (MFC) will be measured by attaching a thermocouple to the exit of the MFC; temperature will be recorded every 5-10 minutes during each run.

- Chilled, empty impingers will be added as needed for moisture removal.
- The volume of water collected in the impingers will be measured and recorded.
- One silonite coated Summa can for sample collection
- Each Summa can will be fitted with a 1-hour flow controller (calibrated and provided by the analytical lab)
- The temperature of the flow controller will be measured by attaching a thermocouple to its outside; temperature will be recorded every 5-10 minutes during each run.

This configuration is applicable because SO_2 is not a concern and the TRS compounds are not soluble enough to be scrubbed out as condensate collects, therefore using citrate buffer and preventing moisture is not necessary. A clean and dry TRS sample may be obtained by placing impingers with a sufficient knockout volume prior to the Summa can.

Although TRS data were not obtained during the pre-test feasibility study, we will target the same 50% dilution ratio. The analytical detection limits for the speciated TRS compounds of interest are less than 10 ppb.

9. **Quality Assurance/Quality Control (QA/QC):** Method-specific quality assurance/quality control procedures must be performed to ensure that the data is valid. Documentation of the procedures and results will be presented in the test report for review. Omission of this critical information may result in rejection of the data, requiring a retest. This documentation will include at least the following:

Manual equipment QA/QC procedures: Field crews will operate the manual testing equipment according to the test method requirements. On-site quality control procedures include:

- Operators will perform pre- and post-test leak checks on the sampling system and pitot lines.
- Thermocouples attached to the pitots and probes are calibrated in the field using EPA Alternate Method 11. A single-point calibration on each thermocouple system using a reference thermometer is performed. Thermocouples must agree within ±2°F with the reference thermometer. Also, prior to use, thermocouple systems are checked for ambient temperature before heaters are started.
- Pitots are examined before and after each use to confirm that they are still aligned.
- Pre- and post-test calibrations on the meter boxes will be included with the report, along with semi-annual calibrations of critical orifices, pitots, and thermocouples (sample box impinger outlet and oven, meter box inlet and outlet, and thermocouple indicators).
- Blank reagents are submitted to the laboratory with the samples. Liquid levels are marked on sample jars in the field and are verified by the laboratory.

Modified EPA Method 308 QA/QC procedures: On-site quality control procedures include:

- The silica gel sorbent tube will be removed prior to the final system leak check per Section 8.1.3 of the method.
- Samples will be shipped on ice and arrive at the lab <20℃. The lab to be used is ALS in Kelso, Washington.

Modified EPA Method 16A/ASTM D 5504-08 QA/QC procedures: On-site quality control procedures include:

- The Summa canisters will have an inner silonite coating to preserve the TRS compounds.
- The initial and final Summa canister vacuum pressures will be recorded.
- The Summa canister will be removed prior to system leak checks.
- The probe tip will be removed from the port pipe fitting and the system will be leak checked from the probe tip by attaching a sample pump to the exit of the final impinger.
- One Summa canister of ambient air will be pulled through the sampling train, immediately following a run so that the sample passes though the un-cleaned probe and impingers with the collected moisture.
- One Summa canister of ambient air will be pulled through a clean probe and empty impingers.
- Based on the assumed constituents of the gas samples, Horizon concludes that they meet the UN description number 3168, Gas sample, non-pressurized, toxic, flammable, n.o.s. UN 3168 is forbidden from transport by air, therefore the Summa canisters will be shipped by ground to the lab (ALS in Simi Valley, CA). Analysis can be expected within 6 to 7 days of sampling.
- The suggested hold time for TRS analysis by ASTM D 5504-08 is a maximum of 7 days.

Audit Sample Requirement:

60.8(g)(1) "No audit samples are required for the following test methods: Methods 3C of Appendix A–3 of Part 60, Methods 6C, 7E, 9, and 10 of Appendix A–4 of Part 60, Method 18 of Appendix A–6 of Part 60, Methods 20, 22, and 25A of Appendix A–7 of Part 60, and Methods 303, 318, 320, and 321 of Appendix A of Part 63."

The EPA Stationary Source Audit Sample Program was restructured and promulgated on September 30, 2010 and was made effective 30 days after that date. The Standard requires that the Facility or their representative must order audit samples if they are available. Currently, accredited Providers offer audit samples for EPA Methods 6, 7, 8, 12, 13A, 13B, 26, 26A, 29 and 101A. If samples are not available from at least two accredited Providers they are not required. The TNI website www.nelac-institute.org/ssas/ will be referred to for a list of available accredited audit Providers and audits.

There are no audit samples available for any of the test methods covered in this test plan. Based on the above, CLW is not required to obtain audit samples for this test program.

10. **Number of Sampling Replicates and their Duration:** Three (3) test runs of approximately 60 minutes at each sample location will be done for each M&D unit. The modified EPA Method 308 and the modified EPA Method 16A sampling will not be done concurrently.

    The modified EPA Method 308 will be sampled at a constant rate between 200-1000 ml/min to target a minimum sample volume of 60 liters.

    The modified EPA Method 16A will be sampled at a constant rate with calibrated flow controllers provided by the lab. Each Summa canister will be fitted with its own 1-hour flow controller.

11. **Chain of Custody:** Chain of custody forms will be completed at the end of each day's sampling and will be included with the samples when shipped to the lab.

12. **Reporting Units for Results:** Methanol results will be expressed as concentrations (ppmv actual basis and dry basis), as rates (lb/hr), and on a production basis (lb/ton of ODP). Methanol emissions measured at both sampling points on each digester will be added then divided by the production rate of that digester.

    TRS results will be reported as concentration, ppmv actual basis and dry basis, uncorrected for oxygen.

13. **Horizon Engrg. Contacts:** David Bagwell or
    Joe Heffernan III
    (503) 255-5050
    Fax (503) 255-0505
    E-mail dbagwell@horizonengineering.com
    jheffernan@horizonengineering.com

14. **Source Site Personnel:** Rick Wilkinson
    (208) 799-1684
    E-mail Rick.Wilkinson@clearwaterpaper.com

    Marv Lewallen
    Office (509)-344-5956
    Mobile (509)-280-5266
    E-mail marv.lewallen@clearwaterpaper.com

    Bob Pernsteiner
    (509) 254-7571
    bobpern@gmail.com

15. **Regulatory Contacts:** Zach Hedgpeth, P.E.
    (206) 553-1217
    E-mail hedgpeth.zach@epa.gov

    Roylene Cunningham
    (206) 553-0513
    E-mail cunningham.roylene@epa.gov

16. **Process Data Collected:** Process data will be gathered by the Site Personnel and provided to Horizon for inclusion in the report for the period of time beginning at least 30 days prior to the testing and extend at least 5 days after the testing concludes . EPA requested that the following process data be collected with a minimum frequency of at least one data point per hour. CLW does not collect all of the requested data on an hourly basis. Exceptions are described in Section 19 (Other Considerations).

    - Sawdust Mass feed rate (bone dry tons/hr)
    - Wood Species (percent)
    - Metering screw rate in revolutions per minute (rpm)
    - Cooking liquor volumetric feed rate
    - Millwater into exhaust chamber volumetric feed rate and temperature
    - Digester production rate (tons of oven dried pulp (ODP)/hr)
    - Exhaust chamber temperature
    - Exhaust condenser temperature
    - Any other process parameter used by the facility or testing firm in determining or calculating emission rates in all units of measure required by the Information Request
    - The following Bauer Valve parameters:
        1. RPM
        2. Recycled steam pressure

17. **Plant Entry & Safety Requirements:** The test team will follow internal safety policies and abide by any site specific safety and entry requirements.

18. **Responsibilities of Test Personnel:** The test team will consist of one Project Manager and three Technicians.

19. **Tentative Test Schedule:**

    Day 1: Mobilize
    Day 2: Test M&D No. 1 – sample point 1A
    Day 3: Test M&D No. 1 – sample point 2A
    Day 4: Test M&D No. 2 – sample point 1B
    Day 5: Test M&D No. 2 – sample point 2B
    Day 6: Demobilize

    Six sample runs will be planned for each day: three modified EPA Method 308 and three modified EPA Method 16A will be done non-simultaneously.

20. **Other Considerations:**

Test Feasibility:
As determined during the feasibility study, the scope of testing covered by the RFI covers internal process gas streams that flow within process equipment that is not designed for sampling or testing. Inherent in these process gases are process liquids, process solids, fluctuating temperatures, and fluctuating moisture concentrations. During the pre-test feasibility study, Horizon Engineering concluded that, in light of process conditions, testing is infeasible for locations 1A, 2A, 1B, 2B, without significant modifications to test methods and atypical effort to reduce clogging and saturation prior to sampling. Even with these adjustments, testing results will be dependent upon process conditions and testers' ability to clear ports of steam saturation. Sampling conditions vary with process conditions and therefore testing feasibility cannot be guaranteed. Specifically, during the pre-test feasibility study, Horizon Engineering encountered significant safety, process, and test sampling concerns. Horizon Engineering was able to address these concerns on sample point 1A and collected methanol. Because sampling for methanol was possible on sample point 1A it is assumed that TRS sampling could also be possible at 1A. However, the temperature was 209°F at 1A and 217°F (steam) at 1B. Testing at location 1A was accomplished during the feasibility study, but would not have been at 1B, in the steam saturated condition. Similar temperatures were measured at process points 2A and 2B. The temperature at 2A was 209°F, and at 2B was 213°F (steam). It is physically impossible to collect an air sample from steam, therefore we conclude that testing in all locations during the scheduled test days will be dependent on process conditions at the time.

In the event that unfavorable testing conditions are encountered during the scheduled test days, Horizon Engineering will use reasonable efforts, considering safety and process limitations to collect valid results. Following attempts to use reasonable efforts to address an unfavorable condition, Horizon Engineering may conclude that testing is infeasible and discontinue work. Information regarding Horizon Engineering's attempts for conform to the RFI and test methods will be provided to EPA in the test report.

Process Data Collection Frequency:
- The sawdust mass feed rate will be calculated once per day.
- One sawdust wood species sample will be taken during the performance test. CLW will provide EPA with 2013 wood species data.
- Mill water temperature going to the exhaust chamber will be measured at the header, upstream from the digesters.
- The digester production rate will be calculated.
- Temperature from the exhaust chamber will be measured and recorded daily (as measured at the exterior surface of the pipe).
- Bauer valve parameters that include recycled steam pressure will be recorded at least once per hour and will be approximated from the digester pressure as there is no transmitter on the actual recycle line.

21. **Administrative Notes:** Unless notified as provided in paragraph #3 of the RFI, this test plan is considered approved for testing. Horizon requests a letter acknowledging receipt and approval of this plan from EPA.

    EPA will be notified of any known changes in test plans prior to testing. Horizon recognizes that significant changes not acknowledged, which could affect accuracy and reliability of the results, could result in test report rejection.

    Test reports will be prepared by Horizon Engineering and will include the sampling site descriptions, procedures, process data, all results and example calculations, field sampling and data reduction procedures, laboratory analysis reports, chain of custody documentation, and QA/QC documentation. The QA/QC documentation will include determination of the method detection level for each test method performed. Source test reports will be submitted to you within 60 days of the completion of the field work, unless another deadline is agreed upon. CLW will send one (1) hardcopy of the completed test report to you at the address above.

    Any questions or comments relating to this test plan should be directed to me.

    Sincerely,

    David Bagwell, QSTI
    Managing Member
    Horizon Engineering, LLC

    cc: Rick Wilkinson, Clearwater Paper Corporation
    Marv Lewallen, Clearwater Paper Corporation
    Bob Pernsteiner, Clearwater Paper Corporation

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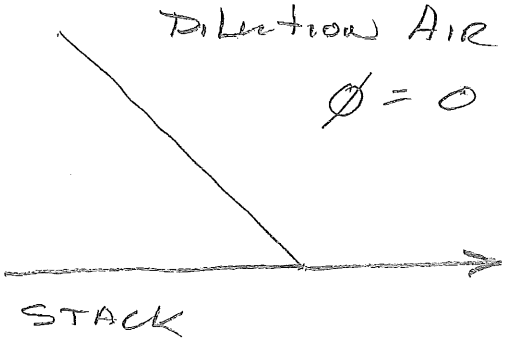
1/2

FROM TESTING

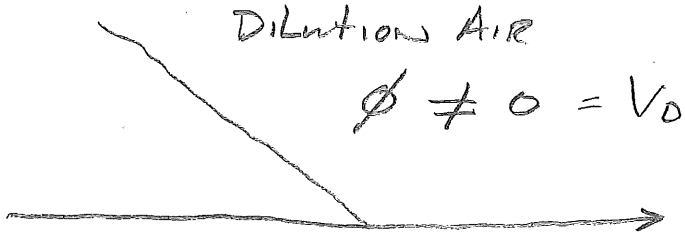


② 299,773 ug MeOH

③ MRL = 673 ug

① $V_{M(STD)} + V_{W(STD)} = 1676\ L_{VAPOR}$

PURPOSE



④ 4 x MRL = 2692 ug

$V_{M(STD)} + V_{W(STD)} = V_S$

$V_D + V_S = 1676\ L$

$$\left(V_D \times 0\right) + \left[V_S \times \left(\frac{299{,}773\ ug}{1676\ L}\right)\right] = 2692\ ug \quad ⑤$$

$$V_S = \frac{2692\,\mu g \times 1676\,L}{299,773\,\mu g} = 15.05\,L$$ (6)

$$V_D = 1676 - 15 = 1661\,L$$

$$\frac{V_D}{V_S} = \frac{1661}{15} = 110.7$$ (1) times as much dilution air as stack gas

Supporting info for dilution sample calc - MeOH

1. 1676 L vapor is the total volume of the sample collected, ie. the volume of the dry gas plus the volume of the water vapor

Volume, Dry standard gas sample 1.97 dscf
Volume, water vapor 57.21 scf
Total = 59.17 dscf x $\frac{28.3169\ L}{1\ cf}$ = 1675.5 L vapor

2. 299,773 µg MeOH is total µg MeOH in 1315.3 ml of condensate/impinger catch.

3. Assumption: if MRL for volume of 43 mL (aliquot volume) is 22 µg then MRL for volume of total condensate/impinger catch is porportionally larger.

$\frac{22\ \mu g}{43\ mL} = \frac{X\ \mu g}{1315.3\ ml} = 673\ \mu g$

4. Assumption: 4 times the MRL gives an adequate "cushion" above MRL so that we stay above it.

5. There will be no MeOH in the dilution air, so set volume of stack gas, which had 299,773 µg in 1676L, equal to 4 x the MRL.

6. Solve to determine ISL of stack gas would be 4 x above MRL.

7. Dilution air can be 110 times the volume of stack gas, and we'd still be 4 x the MRL.

Quality Assurance Documentation

STAC Interim Accreditation Letter
Horizon Engineering QSTI/QI Certification Dates
Qualified Individual (QI) Certificates
QI Statement of Conformance

STAC
STACK TESTING ACCREDITATION COUNCIL
500 W. Wood St., Palatine, IL 60067

10 September 2012

Mr. David Bagwell
Horizon Engineering LLC/AmTest
13585 NE Whitaker Way
Portland, OR 97230

VIA E-mail to David Bagwell (dbagwell@horizonengineering.com) with copy to Troy Burrows (TBurrows@entecservices.com)

Dear Mr. Bagwell:

On behalf of the STAC Board of Directors, I am pleased to inform you that Horizon Engineering LLC/AmTest has been granted interim accreditation by the Stack Testing Accreditation Council (STAC), effective 20 August 2012.

After careful review of your Quality System documentation and procedures, STAC has determined that they are in conformance with ASTM D7036-04 "Standard Practice for the competency of Air Emission Testing Bodies." Final accreditation is contingent upon successful completion of a functional assessment.

During this period of interim accreditation, Horizon Engineering LLC/AmTest may not claim to be a STAC accredited organization, although you may refer to your interim status. To achieve full or final accreditation requires evidence that your Quality System is effectively implemented in your organization as determined by the functional assessment. You may claim that your Quality System meets ASTM D7036 requirements.

Please note that the Attestation of Compliance you signed as part of your application for accreditation requires Horizon Engineering LLC/AmTest to be in continuous compliance with the provisions of ASTM D7036. You are also required to comply with all relevant STAC policies and procedures. I encourage you to review this information, which is available at http://www.betterdata.org/.

If you have any questions, please feel free to contact me at 919.967.0500. Thank you for your participation in the STAC process and congratulations.

Sincerely,
STAC

David L. Elam, Jr.
General Manager

QSTI Employee 02 April 2014	Cert. No.	Group 1 Expirations		Group 2 Expirations		Group 3 Expirations	
		Certificate	Exam (QI)	Certifcate	Exam (QI)	Certificate	Exam (QI)
Andy Vella	2008-247	24 June 2017	24 June 2017	24 June 2017	24 June 2017	25 June 2017	25 June 2017
Angela Hansen	2004-011	-	20 March 2016	-	20 March 2016	20 November 2011	7 March 2011
Carl Slimp	2009-362	22 May 2018	22 May 2018	26 March 2018	26 March 2018	31 July 2018	31 July 2018
C. David Bagwell	2005-022	29 August 2015	22 August 2015	7 June 2016	19 December 2015	29 August 2015	7 March 2015
David de Cesari	2012-743	19 March 2018	-	-	-	-	-
Jason French	2013-771	19 March 2018	05 August 2017	19 March 2018	11 December 2017	19 March 2018	06 August 2017
Jeanni Rupnick	2014-834	-	-	-	-	9 September 2018	9 September 2018
Joe Heffernan III	2009-325	19 September 2016	16 February 2016	19 September 2016	16 February 2016	25 March 2018	25 March 2018
John Lewis	2011-550	24 August 2016	22 August 2015	24 August 2016	22 August 2015	-	-
Kyle Kline	2010-452	23 August 2016	19 December 2015	24 August 2016	7 March 2015	-	-
Tom Lyons	2012-721	30 July 2017	24 June 2017	30 July 2017	24 June 2017	30 July 2017	25 June 2017
Thomas Rhodes	2010-408	22 February 2016	29 December 2015	22 February 2016	29 December 2015	25 March 2018	25 March 2018

QSTI Employee 02 April 2014	Cert. No.	Group 4 Expirations		Group 5 Expirations	
		Certificate	Exam (QI)	Certificate	Exam (QI)
Andy Vella	2008-247	23 August 2016	04 August 2015	-	-
Angela Hansen	2004-011	-	-	-	-
Carl Slimp	2009-362	22 December 2018	22 December 2018	-	-
C. David Bagwell	2005-022	-	11 December 2017	-	-
David de Cesari	2012-743	-	-	-	-
Jason French	2013-771	19 March 2018	11 December 2017	-	-
Jeanni Rupnick	2014-834	22 December 2018	22 December 2018	-	-
Joe Heffernan III	2009-325	19 September 2016	17 February 2016	-	-
John Lewis	2011-550	24 August 2016	19 December 2015	-	-
Kyle Kline	2010-452	23 August 2016	19 December 2015	-	-
Tom Lyons	2012-721	30 July 2017	25 June 2017	-	-
Thomas Rhodes	2010-408	22 February 2016	22 August 2015	-	-

****Red type indicates expired certification or QI as of date above****

Orange type indicates certification/QI within 6 months of expiration from date above

****Green type indicates certification/QI valid for greater than 6 months from date above****

HORIZON ENGINEERING LLC
13585 N.E. Whitaker Way • Portland, OR 97230
Phone (503)255-5050 • Fax (503)255-0505
www.horizonengineering.com

App. # 2009-325

Source Evaluation Society
P. O. Box 12124
Research Triangle Park, NC 27709-2124

JOSEPH M. HEFFERNAN III
Qualified Source Testing Individual

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS - **Effective Sept. 20, 2011 through Sept. 19, 2016** *(exam date: 12/30/10)*
MANUAL GAS SOURCE SAMPLING METHODS
- **Effective Sept. 20, 2011 through Sept. 19, 2016** *(exam date: 3/21/11)*
GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS
- **Effective Mar. 24, 2014 through Mar. 23, 2019** *(exam date: 3/26/13)*
HAZARDOUS METALS MEASUREMENT SAMPLING METHODS
- **Effective Sept. 20, 2011 through Sept. 19, 2016** *(exam date: 12/30/10)*

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

JOSEPH M. HEFFERNAN III

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 20TH DAY OF SEPTEMBER 2011 AND EFFECTIVE UNTIL SEPTEMBER 19TH , 2016

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2009-325

HORIZON ENGINEERING 14-5120

35

SOURCE EVALUATION SOCIETY

SES

Qualified Source Testing Individual

LET IT BE KNOWN THAT

JOSEPH M. HEFFERNAN III

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 20TH DAY OF SEPTEMBER 2011 AND EFFECTIVE UNTIL SEPTEMBER 19TH , 2016

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2009-325

SOURCE EVALUATION SOCIETY CORPORATE SEAL 1995 NORTH CAROLINA

App. # 2012-721

Source Evaluation Society
P. O. Box 12124
Research Triangle Park, NC 27709-2124

THOMAS A. LYONS

Qualified Source Testing Individual

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS - **Effective Jul. 31, 2012 through Jul. 30, 2017** *(exam date: 6/25/12)*
MANUAL GAS SOURCE SAMPLING METHODS
- **Effective Jul. 31, 2012 through Jul. 30, 2017** *(exam date: 6/25/12)*
GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS
- **Effective Jul. 31, 2012 through Jul. 30, 2017** *(exam date: 6/26/12)*
HAZARDOUS METALS MEASUREMENT SAMPLING METHODS
- **Effective Jul. 31, 2012 through Jul. 30, 2017** *(exam date: 6/26/12)*

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

THOMAS A. LYONS

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 31st DAY OF JULY 2012 AND EFFECTIVE UNTIL JULY 30TH, 2017

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2012-721

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

THOMAS A. LYONS

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 31st DAY OF JULY 2012 AND EFFECTIVE UNTIL JULY 30TH, 2017

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2012-721

HORIZON ENGINEERING 14-5110

261

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

KYLE R. KLINE

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 24TH DAY OF AUGUST 2011 AND EFFECTIVE UNTIL AUGUST 23RD , 2016

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2010-452

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

KYLE R. KLINE

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 25TH DAY OF AUGUST 2010 AND EFFECTIVE UNTIL AUGUST 24TH, 2015

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2010-452

HORIZON ENGINEERING LLC
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

Qualified Individual Statement of Conformance

I, as a qualified individual, agree that all projects of which I participate will conform to the policies set forth in Horizon Engineering, LLC's quality manual and to the standards outlined in ASTM D7036 in all respects.

Signature: _____

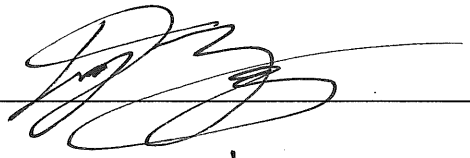
Name (print): Jay Heffernan III

Date: 8/16/12

HORIZON ENGINEERING LLC
13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

Qualified Individual Statement of Conformance

I, as a qualified individual, agree that all projects for which I participate will conform to the policies set forth in Horizon Engineering, LLC's quality assurance manual and to the standards outlined in ASTM D7036 in all respects.

Signature: 

Name (print): Thomas Lyons

Date: 9-24-12

HORIZON ENGINEERING LLC

13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

Qualified Individual Statement of Conformance

I, as a qualified individual, agree that all projects for which I participate will conform to the policies set forth in Horizon Engineering, LLC's quality assurance manual and to the standards outlined in ASTM D7036 in all respects.

Signature: Kyle Kline

Name (print): Kyle Kline

Date: 9/24/12

HORIZON ENGINEERING LLC

13585 NE Whitaker Way • Portland, OR 97230
Phone (503) 255-5050 • Fax (503) 255-0505
www.horizonengineering.com

Qualified Individual Statement of Conformance

I, as a qualified individual, agree that all projects of which I participate will conform to the policies set forth in Horizon Engineering, LLC's quality manual and to the standards outlined in ASTM D7036 in all respects.

Signature: _____

Name (print): Jason Sweeney

Date: 2-3-14

Personnel Qualifications

JOSEPH M. HEFFERNAN III, QSTI (GI-IV)
PROJECT MANAGER/TEAM LEADER

EDUCATION/PROFESSIONAL CERTIFICATIONS/TRAINING

- Qualified Source Test Individual (QSTI)
  - Group I, *Manual Gas Volume and Flow Measurements and Isokinetic Particulate Sampling Methods*
  - Group II, Manual Gas Source Sampling Methods
  - Group III, Gaseous Pollutants Instrumental Methods
  - Group IV, *Hazardous Metals Measurements*
- B.S. in Physical Education from Northern Illinois University, 1999
- Minor in Marketing, with emphasis in Sports Marketing
- Certified Visible Emissions Evaluator
- C-Stop Certified (includes refinery operations, industrial accident prevention, PPE, LOTO, HAZCOM/HAZMAT, confined space, emergency response, respiratory protection, MSDS review, toxic and hazardous substances)
- Aerial Platform Certified
- Transportation Worker Identification Credential (TWIC) Approved
- International Air Transport Association (IATA) Trained
- Respirator Fit-Tested
- Adult CPR Certified
- Standard First Aid Certified

PROFESSIONAL DEVELOPMENT

- Stationary Source Sampling and Analysis for Air Pollutants (SSSAAP) Conference, 2008, 2011

PROFESSIONAL MEMBERSHIPS

- Source Evaluation Society (SES)

PROFESSIONAL EXPERIENCE

Joe Heffernan has been with Horizon Engineering since 2004. He brings four prior years experience from another air pollution testing organization in Illinois for a total of more than 12 years of professional experience in the field of air quality. He has performed source tests at hundreds of industrial sources domestically and internationally and has developed the skills necessary to earn the title of Project Manager. He performs source emission testing and activities related to source emission testing, including field sampling, test equipment maintenance and calibration, equipment preparation, and in-field data recording. He is thoroughly trained in all EPA source test procedures 2000-present. He is also experienced using methods from the National Council for Air & Stream Improvement (NCASI), Oregon Department of Environmental Quality (ODEQ), California Air Resource Board (CARB), National Institute for Occupational Health and Safety (NIOSH), Occupational Safety and Health Administration (OSHA), and the American Society for Testing and Materials (ASTM).

THOMAS A. LYONS
FIELD TECHNICIAN III

EDUCATION/PROFESSIONAL CERTIFICATIONS/TRAINING

- Qualified Source Test Individual (QSTI)
  - Group I, *Manual Gas Volume and Flow Measurements and Isokinetic Particulate Sampling Methods*
  - Group II, Manual *Gaseous Pollutants Source Sampling Methods*
  - Group III, *Gaseous Pollutants Instrumental Methods*
  - Group IV, *Hazardous Metals Measurements*
- B.S. in Biology from University of Oregon, 2008
- Minor in Biochemistry and Computer Information Technology
- Studied abroad at University of Otago, New Zealand, 2005
- Certified Visible Emissions Evaluator
- C-Stop Certified (includes refinery operations, industrial accident prevention, PPE, LOTO, HAZCOM/HAZMAT, confined space, emergency response, respiratory protection, MSDS review, toxic and hazardous substances)
- Aerial Platform Certified
- Transportation Worker Identification Credential (TWIC) Approved
- International Air Transport Association (IATA) Trained
- Respirator Fit-Tested
- Adult CPR Certified
- Standard First Aid Certified
- Wilderness First Responder (WFR) and Emergency Medical Training (EMT), 2010

PROFESSIONAL MEMBERSHIPS

- Source Evaluation Society (SES)

PROFESSIONAL EXPERIENCE

Thomas Lyons joined Horizon Engineering in 2011. He brings three prior years of laboratory experience as a cell biologist and a quality control technician. He performs source emission testing and activities related to source emission testing, including field sampling, test equipment maintenance and calibration, equipment preparation, and in-field data recording.

KYLE R. KLINE, QSTI (GI, II, IV)
FIELD TECHNICIAN III

EDUCATION/PROFESSIONAL CERTIFICATIONS/TRAINING

- Qualified Source Test Individual (QSTI)
  - Group I, *Manual Gas Volume and Flow Measurements and Isokinetic Particulate Sampling Methods*
  - Group II, *Manual Gaseous Pollutants Source Sampling Methods*
  - Group IV, *Hazardous Metals Measurements*
- B.S. in Environmental Studies from Southern Oregon University, 1999
- Certified Visible Emissions Evaluator
- C-Stop Certified (includes refinery operations, industrial accident prevention, PPE, LOTO, HAZCOM/HAZMAT, confined space, emergency response, respiratory protection, MSDS review, toxic and hazardous substances)
- North Slope Training Co-operative class for Unescorted North Slope Safety Orientation (Awareness Level)
- Aerial Platform Certified
- Transportation Worker Identification Credential (TWIC) Approved
- International Air Transport Association (IATA) Trained
- Respirator Fit-Tested
- Adult CPR Certified
- Standard First Aid Certified

PROFESSIONAL DEVELOPMENT

- Stationary Source Sampling and Analysis for Air Pollutants (SSSAAP) Conference, 2010

PROFESSIONAL MEMBERSHIPS

- Source Evaluation Society (SES)

PROFESSIONAL EXPERIENCE

Kyle Kline has been with Horizon Engineering since 2004. He brings four seasons of prior experience working as an Air Quality Field Technician in Yosemite National Park. He has performed source tests at hundreds of industrial sources. He performs source emission testing and activities related to source emission testing, including field sampling, test equipment maintenance and calibration, equipment preparation, and in-field data recording. He is thoroughly trained in all EPA source test procedures 2004-present. He is also experienced using methods from the National Council for Air & Stream Improvement (NCASI), Oregon Department of Environmental Quality (ODEQ), California Air Resource Board (CARB), National Institute for Occupational Health and Safety (NIOSH), Occupational Safety and Health Administration (OSHA), and the American Society for Testing and Materials (ASTM).

JASON SWEENEY
FIELD TECHNICIAN I

EDUCATION/PROFESSIONAL CERTIFICATIONS/TRAINING

- B.S. in Environmental Science, University of Idaho, Moscow, Idaho, 2005
- Certified Visible Emissions Evaluator
- C-Stop Certified (includes refinery operations, industrial accident prevention, PPE, LOTO, HAZCOM/HAZMAT, confined space, emergency response, respiratory protection, MSDS review, toxic and hazardous substances)
- Certified Oregon Boater, State Marine Board
- Certified Marbled Murrelet Surveyor
- Aerial Platform Certified
- Transportation Worker Identification Credential (TWIC) Approved
- International Air Transport Association (IATA) Trained
- Respirator Fit-Tested
- Certified First Responder
- Red Cross CPR Certified
- Red Cross First Aid Certified

PROFESSIONAL EXPERIENCE

Jason Sweeney has been with Horizon Engineering since October 2013. He brings six prior years experience working for Environ International Corporation. His primary duties before joining Horizon were ambient air quality monitoring, soil monitoring, and water quality monitoring. He also assisted in developing a web-based information management system for litigation support and performed contaminated site assessments. He also worked previously as an air quality technician with the Idaho Department of Environmental Quality and as a forest technician and fireman with the Idaho Department of Lands.

With Horizon, he performs source emission testing and activities related to source emission testing, including field sampling, test equipment maintenance and calibration, equipment preparation, and in-field data recording. He is being trained to perform source emission testing and activities related to testing, field sampling, test equipment maintenance and calibration, equipment preparation, and in-field data recording. He is familiar with all EPA source test procedures and is also learning methods from the National Council for Air & Stream Improvement (NCASI), Oregon Department of Environmental Quality (ODEQ), California Air Resource Board (CARB), National Institute for Occupational Health and Safety (NIOSH), Occupational Safety and Health Administration (OSHA), and the American Society for Testing and Materials (ASTM).

DAVID BAGWELL, QSTI (GI-III)
MANAGING MEMBER/TECHNICAL MANAGER

EDUCATION/PROFESSIONAL CERTIFICATIONS/TRAINING

- Qualified Source Test Individual (QSTI)
  - Group I, *Manual Gas Volume and Flow Measurements and Isokinetic Particulate Sampling Methods*
  - Group II, *Manual Gaseous Pollutants Source Sampling Methods*
  - Group III, *Gaseous Pollutants Instrumental Methods*
  - Group IV, *Hazardous Metals Measurements* (passed exam, application pending)
- B.S. in Industrial Management from the Georgia Institute of Technology, 1993
- Certified Visible Emissions Evaluator
- C-Stop Certified (includes refinery operations, industrial accident prevention, PPE, LOTO, HAZCOM/HAZMAT, confined space, emergency response, respiratory protection, MSDS review, toxic and hazardous substances)
- Aerial Platform Certified
- Transportation Worker Identification Credential (TWIC) Approved
- International Air Transport Association (IATA) Trained
- Adult CPR Certified
- Standard First Aid Certified

PROFESSIONAL DEVELOPMENT

- Fundamentals of Source Sampling, instructed by Mr. Bill Timpone, 1994
- Fundamentals of Enforcement, California Air Resources Board, 2007
- Stationary Source Sampling and Analysis for Air Pollutants (SSSAAP) Conference, attended since approximately year 2000

PROFESSIONAL MEMBERSHIPS

- Air and Waste Management Association (A&WMA)
- Pacific Northwest International Section of A&WMA (PNWIS)
- Source Evaluation Society (SES)

AWARDS RECEIVED

- PNWIS/A&WMA Hardhat Award, 2007
- SES Matthew S. DeVito Award, 2011

CURRENT LEADERSHIP POSITIONS

- Source Evaluation Society QSTI/QSTO Review Panel
- Source Evaluation Society Board of Directors Member
- PNWIS, Oregon Chapter Board of Directors Member

PROFESSIONAL EXPERIENCE

David Bagwell has been with Horizon Engineering since 1997 and acquired the company in 2008. He brings three prior years experience from other air pollution testing organizations in Georgia and Oregon for a total of more than 20 years of professional experience in the field of air quality. He has tested over a thousand sources domestically and internationally and now owns and manages a successful multi-office source testing firm with over 20 employees. He is thoroughly trained in all EPA source test procedures 1994-present. He is also experienced using methods from the National Council for Air & Stream Improvement (NCASI), Oregon Department of Environmental Quality (ODEQ), California Air Resource Board (CARB), National Institute for Occupational Health and Safety (NIOSH), Occupational Safety and Health Administration (OSHA), and the American Society for Testing and Materials (ASTM). At the SES conference in 2011, David received the Matthew S. DeVito award for his dedication to data quality, commitment to staff education and safe field and laboratory practices, and his support of the SES QSTI/QSTO program,

MICHAEL E. WALLACE, P.E.
SENIOR ENGINEER

EDUCATION/PROFESSIONAL CERTIFICATIONS/TRAINING

- Professional Engineer (P.E.) from the State of Oregon, 2002-present
- B.S. in Mechanical Engineering from Oregon State University in Corvallis, Oregon, 1989
- Respirator Fit-Tested
- Adult CPR Certified
- Standard First Aid Certified

PROFESSIONAL DEVELOPMENT

- Stationary Source Sampling and Analysis for Air Pollutants (SSSAAP) Conference, approximately 5 years

PROFESSIONAL MEMBERSHIPS

- Source Evaluation Society (SES)

PROFESSIONAL EXPERIENCE

Mike Wallace has been with Horizon Engineering since 1991. He is responsible for performing calculations, formulating spreadsheets, quality assurance review, and operating Horizon's gas chromatograph. He is thoroughly trained in all EPA source test procedures 1991-present. He is also experienced using methods from the National Council for Air & Stream Improvement (NCASI), Oregon Department of Environmental Quality (ODEQ), California Air Resource Board (CARB), National Institute for Occupational Health and Safety (NIOSH), Occupational Safety and Health Administration (OSHA), and the American Society for Testing and Materials (ASTM).

PATRICIA LYNN (KATE) KRISOR
SENIOR TECHNICAL REPORT WRITER/SAFETY MANAGER

EDUCATION/PROFESSIONAL CERTIFICATIONS/TRAINING

- B.A. in General Science from Portland State University in Portland, Oregon, 1995
- Minor in Technical Writing
- International Air Transport Association (IATA) Trained
- Adult CPR Certified
- Standard First Aid Certified

PROFESSIONAL DEVELOPMENT

- EPA Webinars on Boiler and Process Heater Emission Testing for Boiler/CISCWI ICR, June 18, 2009 and September 18, 2009

PROFESSIONAL MEMBERSHIPS

- Source Evaluation Society (SES)

PROFESSIONAL EXPERIENCE

Kate Krisor has been with Horizon Engineering since 1995. Her current responsibilities include data reduction and analysis, quality assurance review, and report preparation. She is also the Safety Manager for Horizon and tracks our cylinder gas inventory. She is thoroughly trained in all EPA source test procedures 1995-present. She is also experienced researching/reporting methods from the National Council for Air & Stream Improvement (NCASI), Oregon Department of Environmental Quality (ODEQ), California Air Resource Board (CARB), National Institute for Occupational Health and Safety (NIOSH), Occupational Safety and Health Administration (OSHA), and the American Society for Testing and Materials (ASTM).

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